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ABSTRACT

This report presents the implementation results of a pilot test of a manpower planning methodology developed by the U.S. Environmental Protection Agency (EPA), Office of Water Programs. Project outputs and projections are described and illustrated in sections of the report dealing with work to be done, organizational staffing plan, transfers and new hires needed, training needs and identification of manpower problems. The study provided a data base of manpower needs and current staff; this information can serve as a basis for future planning and for evaluation of plans that are made. (CS)

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ED150012

MANPOWER PLANNING
FOR
MUNICIPAL WASTEWATER TREATMENT
IN TEXAS

LP-8

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TEXAS DEPARTMENT OF WATER RESOURCES

December 1977

MANPOWER PLANNING FOR MUNICIPAL WASTEWATER TREATMENT IN TEXAS

LP-8

Texas Department of Water Resources

December 1977

FOREWORD

Effective September 1, 1977, Texas three water resources agencies, the Texas Water Rights Commission, the Texas Water Development Board, and the Texas Water Quality Board, were consolidated to form the Texas Department of Water Resources. A number of publications prepared under the auspices of the predecessor agencies are being published by the TDWR. To effect as little delay as possible in production of these publications, references to these predecessor agencies will not be altered except on their covers and title pages.

Harvey Davis

Harvey Davis
Executive Director

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1700 NORTH CONGRESS AVE.
P.O. BOX 13246 CAPITOL STATION 78711
AUSTIN, TEXAS

October 18, 1976

Re: Manpower Planning - Manpower Planning and Surveys

Ms. Pat Allbright, Chief
Office of Manpower Training
Environmental Protection Agency, Region VI
First National Bank Building
1201 Elm Street
Dallas, Texas 75270

Dear Ms. Allbright:

I am pleased to forward the following materials (in Tab A) to complete our FY 76 "106" commitment for the development of information concerning wastewater treatment plant manpower and training needs in Texas.

Exhibit 1 - Manpower forecasts which include a five year summary and forecasts for each of the next five years. (Explanation in Tab B, Exhibit 1).

Exhibit 2 - Analysis of training loads. This includes a separate analysis for each of the three types of training required: entry, update or renewal (continuing education) and upgrade. (Explanation in Tab B, Exhibit 1).

Exhibit 3 - Age and educational characteristics of Texas municipal wastewater treatment plant certified personnel.

Exhibit 4 - Data on current employment status of certified personnel not engaged in wastewater treatment.

The methodology used and limitations of the manpower and training assessments are explained in the exhibits of Tab B. Exhibit 1 contains a guide for relating the footnotes in the exhibits of Tab A to the methodology explanations. Also enclosed is a paper (Tab C) which explains the basic concepts and approach which were applied.

We consider our efforts in this matter, which were generated by our meeting in Dallas in June, 1975, to have been extremely beneficial.

1. We now have a data base, while being subject to refinement, gives us a rational assessment of the magnitude of our wastewater treatment plant manpower needs and training loads.

2. We have improved our knowledge of the methodologies involved and problems to be overcome for valid manpower assessments.

3. We have identified and have started to develop the systems required to continually update and refine this information.

Specific actions we have planned to take, or are underway in this area include:

1. We are now working with the assistance of the University of Texas at Austin to prepare a methodology of instructions that can be used by ourselves and others to develop manpower and training needs information on a continuing basis. This will draw from experience gained in this analysis and will provide for improved inputs from our operation and maintenance (O&M) and construction grant programs as well as more valid training need and resource information.

2. Preparing, with the University of Texas at Austin, to apply for an Environmental Protection Agency or Office of Education grant to design a computer based information system for compiling and reporting manpower/training data on a continuing basis.

3. Developing an approach for establishing manpower planning self-sufficiency in major cities, utilizing our methodologies. This will also provide for our aggregation of statewide statistics from local level inputs.

4. Discussing with Sam Warrington, Chief of the Certification and Registration Branch, Texas Department of Health Resources, the possibility of extending manpower planning to water supply facilities. Mr. Warrington agrees that this is essential because of the large number of people who work at both water and wastewater treatment plants.

We appreciate the guidance and support provided by Morton Ettelstein, Chief of the Manpower Planning Office, Office of Water Program, EPA, in designing and implementing this effort. The cooperative working relationship which exists between the Texas Water Quality Board and the EPA is of critical importance in helping local units of government meet their particular manpower and training needs.

We are pleased to have an active part in the U.S. Environmental Protection Agency's Region VI Manpower Program; and if I can be of further assistance, please do not hesitate to call or write.

Sincerely,

Tom Jackson

Tom Jackson
Engineering Technician

THROUGH:

Bobby D. Whitefield

Bobby D. Whitefield, Chief
Environmental Education & Training Section
Central Operations Division

TJ:eb

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TAB A

EXHIBIT 1 - MANPOWER FORECASTS
(See Tab B, Exhibit 1, for explanation)

TEXAS MUNICIPAL WASTEWATER
TREATMENT PLANT CERTIFIED
PERSONNEL [a]

Analysis of Manpower Needs
For All Flow Sizes
(Five Year Total)

	EMPLOYMENT			ACCESSIONS NEEDED				SOURCES OF ACCESSIONS		
					REPLACE LOSSES					
	CURRENT - JAN. '76 [b]	RECOMMENDED [c]	PROJECTED - JAN. '81 [d]	PLANT EXPANSIONS [d]	SEPARATIONS [e]	TRANSFERS OUT [e]	TOTAL	TRANSFERS IN [e]	NEW HIRES [e]	TOTAL
TOTAL	3076		4576	1500	1670	2128	5298	2128	3170	5298
SUPERVISORS	1183		1578	395	596	222	1213	871	342	1213
A	80		132	52	36	0	88	88	0	88
B	343		494	151	115	35	301	301	0	301
C	640		814	174	403	116	693	416	277	693
D	120		138	18	42	71	131	66	65	131
Unknown WW Grade [f]	87									
OPERATORS	1438		2282	844	818	1672	3334	1023	2311	3334
A	15		24	9	7	21	37	37	0	37
B	382		639	257	111	164	532	480	52	532
C	764		1211	447	494	740	1681	506	1175	1681
D	277		408	131	206	747	1084	0	1084	1084
Unknown WW Grade [f]	54									
LAB TECHNICIANS	144		243	99	71	109	279	109	170	279
A	9		16	7	3	0	10	10	0	10
B	66		113	47	18	10	75	67	8	75
C	46		76	30	30	53	113	32	81	113
D	23		38	15	20	46	81	0	81	81
Unknown WW Grade [f]	8									
MAINTENANCE	311		473	162	185	125	472	125	347	472
A	3		6	3	2	0	5	5	0	5
B	54		91	37	14	5	56	51	5	56
C	175		263	88	113	41	242	69	173	242
D	79		113	34	56	79	169	0	169	169
Unknown WW Grade [f]	59									

TEXAS MUNICIPAL WASTEWATER
TREATMENT PLANT CERTIFIED
PERSONNEL

Analysis of Manpower Needs

For Plants With Average
Flows of <1MGD
(Five Year Total)

	EMPLOYMENT			ACCESSIONS NEEDED				SOURCES OF ACCESSIONS		
					REPLACE LOSSES					
	b CURRENT - JAN. '76	c RECOMMENDED	d PROJECTED - JAN. '81	d PLANT EXPANSIONS	e SEPARATIONS	e TRANSFERS OUT	TOTAL	e TRANSFERS IN	e NEW HIRES	TOTAL
TOTAL	1271		1369	98	642	536	1276	536	740	1276
SUPERVISORS	748		806	58	391	95	544	357	187	544
A	14		15	1	10	0	11	11	0	11
B	165		178	13	68	5	86	86	0	86
C	461		497	36	285	51	372	223	149	372
D	108		116	8	28	39	75	37	38	75
Unknown WW Grade f	56									
OPERATORS	401		432	31	193	425	649	163	486	649
A	3		4	1	2	5	8	8	0	8
B	64		69	5	27	19	51	46	5	51
C	215		231	16	133	209	358	109	249	358
D	119		128	9	31	192	232	0	232	232
Unknown WW Grade f	24									
LAB TECHNICIANS	13		14	1	6	3	10	3	7	10
A	0		0	0	0	0	0	0	0	0
B	5		6	1	2	0	3	3	0	3
C	5		5	0	3	3	6	0	6	6
D	3		3	0	1	0	1	0	1	1
Unknown WW Grade f	2									
MAINTENANCE	109		117	8	52	13	73	13	60	73
A	0		0	0	0	0	0	0	0	0
B	7		8	1	2	0	3	3	0	3
C	66		71	5	41	3	49	10	39	49
D	36		38	2	9	10	21	0	21	21
Unknown WW Grade f	31									

TEXAS MUNICIPAL WASTEWATER TREATMENT PLANT CERTIFIED PERSONNEL[a]

Analysis of Manpower Needs
For Plants With Average
Flows of $\geq$1MGD
(Five Year Total)

	EMPLOYMENT			ACCESSIONS NEEDED				SOURCES OF ACCESSIONS		
					REPLACE LOSSES					
	CURRENT - JAN. '76[b]	RECOMMENDED[c]	PROJECTED - JAN. '81[d]	PLANT EXPANSIONS[d]	SEPARATIONS[e]	TRANSFERS OUT[e]	TOTAL	TRANSFERS IN[e]	NEW HIRES[e]	TOTAL
TOTAL	1805		3207	1402	1028	1592	4022	1592	2430	4022
SUPERVISORS	435		772	337	205	127	669	514	155	669
A	66		117	51	26	0	77	77	0	77
B	178		316	138	47	30	215	215	0	215
C	179		317	138	118	65	321	193	128	321
D	12		22	10	14	32	56	29	27	56
Unknown WW Grade[f]	31									
OPERATORS	1037		1850	813	625	1247	2685	860	1825	2685
A	12		20	8	5	16	29	29	0	29
B	318		570	252	84	145	481	434	47	481
C	549		980	431	361	531	1323	397	926	1323
D	158		280	122	175	555	852	0	852	852
Unknown WW Grade[f]	30									
LAB TECHNICIANS	131		229	98	65	106	269	106	163	269
A	9		16	7	3	0	10	10	0	10
B	61		107	46	16	10	72	64	8	72
C	41		71	30	27	50	107	32	75	107
D	20		35	15	19	46	80	0	80	80
Unknown WW Grade[f]	6									
MAINTENANCE	202		356	154	133	112	399	112	287	399
A	3		6	3	2	0	5	5	0	5
B	47		83	36	12	5	53	48	5	53
C	109		19[illegible]	83	72	38	193	59	134	193
D	43		75	32	47	69	148	0	148	148
Unknown WW Grade[f]	28									

TEXAS MUNICIPAL WASTEWATER
TREATMENT PLANT CERTIFIED
PERSONNEL [a]

Analysis of Manpower Needs
(For All Flow Sizes)

	EMPLOYMENT			ACCESSIONS NEEDED				SOURCES OF ACCESSIONS		
					REPLACE LOSSES					
	CURRENT - JAN. '76 [b]	RECOMMENDED [c]	PROJECTED - JAN. '77 [d]	PLANT EXPANSIONS [d]	SEPARATIONS [e]	TRANSFERS OUT [e]	TOTAL	TRANSFERS IN [e]	NEW HIRES [e]	TOTAL
TOTAL	3076		3375	299	281	397	977	397	580	977
SUPERVISORS	1183		1263	80	106	41	227	163	64	227
A	80		90	10	6	0	16	16	0	16
B	343		374	31	20	6	57	57	0	57
C	640		675	35	73	22	130	78	52	130
D	120		124	4	7	13	24	12	12	24
Unknown WW Grade [f]	87									
OPERATORS	1438		1606	168	133	312	613	190	423	613
A	15		17	2	1	4	7	7	0	7
B	382		433	51	18	31	100	90	10	100
C	764		853	89	81	139	309	93	216	309
D	277		303	26	33	138	197	0	197	197
Unknown WW Grade [f]	54									
LAB TECHNICIANS	144		163	19	11	20	50	20	30	50
A	9		10	1	1	0	2	2	0	2
B	66		75	9	2	2	13	12	1	13
C	46		52	6	5	9	20	6	14	20
D	23		26	3	3	9	15	0	15	15
Unknown WW Grade [f]	8									
MAINTENANCE	311		343	32	31	24	87	24	63	87
A	3		4	1	0	0	1	1	0	1
B	54		61	7	3	1	11	10	1	11
C	175		192	18	19	8	45	13	32	45
D	79		85	6	9	15	30	0	30	30
Unknown WW Grade [f]	59									

TEXAS MUNICIPAL WASTEWATER
TREATMENT PLANT CERTIFIED
PERSONNEL a

Analysis of Manpower Needs
(For Plants with Average
Flows of < 1MCD)

	EMPLOYMENT			ACCESSIONS NEEDED				SOURCES OF ACCESSIONS		
					REPLACE LOSSES					
	b CURRENT - JAN. '76	c RECOMMENDED	d PROJECTED - JAN. '77	d PLANT EXPANSIONS	e SEPARATIONS	e TRANSFERS OUT	TOTAL	e TRANSFERS IN	e NEW HIRES	TOTAL
TOTAL	1271		1290	19	124	102	245	102	143	245
SUPERVISORS	748		760	12	75	18	105	69	36	105
A	14		14	0	2	0	2	2	0	2
B	165		168	3	13	1	17	17	0	17
C	461		468	7	55	10	72	43	29	72
D	108		110	2	5	7	14	7	7	14
Unknown WW Grade f	56									
OPERATORS	401		407	6	37	81	124	30	94	124
A	3		3	0	0	1	1	1	0	1
B	64		65	1	5	3	9	8	1	9
C	215		218	3	26	40	69	21	48	69
D	119		121	2	6	37	45	0	45	45
Unknown WW Grade f	24									
LAB TECHNICIANS	13		13	0	1	0	1	0	1	1
A	0		0	0	0	0	0	0	0	0
B	5		5	0	0	0	0	0	0	0
C	5		5	0	1	0	1	0	1	1
D	3		3	0	0	0	0	0	0	0
Unknown WW Grade f	2									
MAINTENANCE	109		110	1	11	3	15	3	12	15
A	0		0	0	0	0	0	0	0	0
B	7		7	0	1	0	1	1	0	1
C	66		67	1	8	1	10	2	8	10
D	36		36	0	2	2	4	0	4	4
Unknown WW Grade f	31									

TEXAS MUNICIPAL WASTEWATER TREATMENT PLANT CERTIFIED PERSONNEL a

Analysis of Manpower Needs (For Plants With Average Flows of $\geq$ 1MGD)

	EMPLOYMENT			ACCESSIONS NEEDED				SOURCES OF ACCESSIONS		
					REPLACE LOSSES					
	CURRENT - JAN. '76	RECOMMENDED	PROJECTED - JAN. '77	PLANT EXPANSIONS	SEPARATIONS	TRANSFERS OUT	TOTAL	TRANSFERS IN	NEW HIRES	TOTAL
	b	c	d	d	e	e		e	e	
TOTAL	1805		2085	280	157	295	732	295	437	732
SUPERVISORS	435		503	68	31	23	122	94	28	122
A	66		76	10	4	0	14	14	0	14
B	178		206	28	7	5	40	40	0	40
C	179		207	28	18	12	58	35	23	58
D	12		14	2	2	6	10	5	5	10
Unknown WW Grade f	31									
OPERATORS	1037		1199	162	96	231	489	160	329	489
A	12		14	2	1	3	6	6	0	6
B	318		368	50	13	28	91	82	9	91
C	549		635	86	55	99	240	72	168	240
D	158		182	24	27	101	152	0	152	152
Unknown WW Grade f	30									
LAB TECHNICIANS	131		150	19	10	20	49	20	29	49
A	9		10	1	1	0	2	2	0	2
B	61		70	9	2	2	13	12	1	13
C	41		47	6	4	9	19	6	13	19
D	20		23	3	3	9	15	0	15	15
Unknown WW Grade f	6									
MAINTENANCE	202		233	31	20	21	72	21	51	72
A	3		4	1	0	0	1	1	0	1
B	47		54	7	2	1	10	9	1	10
C	109		126	17	11	7	35	11	24	35
D	43		49	6	7	13	26	0	26	26
Unknown WW Grade f	28									

TEXAS MUNICIPAL WASTEWATER
TREATMENT PLANT CERTIFIED
PERSONNEL a

Analysis of Manpower Needs
For All Flow Sizes

	EMPLOYMENT			ACCESSIONS NEEDED				SOURCES OF ACCESSIONS		
					REPLACE LOSSES					
	b CURRENT - JAN. '77	c RECOMMENDED	d PROJECTED - JAN. '78	d PLANT EXPANSIONS	e SEPARATIONS	e TRANSFERS OUT	TOTAL	e TRANSFERS IN	e NEW HIRES	TOTAL
TOTAL	3375		3674	299	309	410	1018	410	608	1018
SUPERVISORS	1263		1343	80	113	44	237	170	67	237
A	90		100	10	7	0	17	17	0	17
B	374		405	31	21	7	59	59	0	59
C	675		710	35	77	23	135	81	54	135
D	124		128	4	8	14	26	13	13	26
OPERATORS	1606		1774	168	148	322	638	196	442	638
A	17		19	2	1	4	7	7	0	7
B	433		484	51	20	31	102	92	10	102
C	853		942	89	90	143	322	97	225	322
D	303		329	26	37	144	207	0	207	207
LAB TECHNICIANS	163		182	19	14	20	53	20	33	53
A	10		11	1	1	0	2	2	0	2
B	75		84	9	3	2	14	12	2	14
C	52		58	6	6	10	22	6	16	22
D	26		29	3	4	8	15	0	15	15
MAINTENANCE	343		375	32	34	24	90	24	66	90
A	4		5	1	0	0	1	1	0	1
B	61		68	7	3	1	11	10	1	11
C	193		211	18	21	8	47	13	34	47
D	85		91	6	10	15	31	0	31	31

TEXAS MUNICIPAL WASTEWATER TREATMENT PLANT CERTIFIED PERSONNEL [a]

Analysis of Manpower Needs
(For Plants With Average Flows of < 1MGD)

	EMPLOYMENT			ACCESSIONS NEEDED				SOURCES OF ACCESSIONS		
					REPLACE LOSSES					
	b CURRENT - JAN. '77	c RECOMMENDED	d PROJECTED - JAN. '78	d PLANT EXPANSIONS	e SEPARATIONS	e TRANSFERS OUT	TOTAL	e TRANSFERS IN	e NEW HIRES	TOTAL
TOTAL	1290		1309	19	126	104	249	104	145	249
SUPERVISORS	760		772	12	77	19	108	71	37	108
A	14		14	0	2	0	2	2	0	2
B	168		171	3	13	1	17	17	0	17
C	468		475	7	56	10	73	44	29	73
D	110		112	2	6	8	16	8	8	16
OPERATORS	407		413	6	37	82	125	30	95	125
A	3		3	0	0	1	1	1	0	1
B	65		66	1	5	3	9	8	1	9
C	218		221	3	26	40	69	21	48	69
D	121		123	2	6	38	46	0	46	46
LAB TECHNICIANS	13		13	0	1	0	1	0	1	1
A	0		0	0	0	0	0	0	0	0
B	5		5	0	0	0	0	0	0	0
C	5		5	0	1	0	1	0	1	1
D	3		3	0	0	0	0	0	0	0
MAINTENANCE	110		111	1	11	3	15	3	12	15
A	0		0	0	0	0	0	0	0	0
B	7		7	0	1	0	1	1	0	1
C	67		68	1	8	1	10	2	8	10
D	36		36	0	2	2	4	0	4	4

TEXAS MUNICIPAL WASTEWATER
TREATMENT PLANT CERTIFIED
PERSONNEL a

Analysis of Manpower Needs
(For Plants With Average
Flows of $\geq$ 1MGD)

	EMPLOYMENT			ACCESSIONS NEEDED				SOURCES OF ACCESSIONS		
					REPLACE LOSSES					
	b CURRENT - JAN. '77	c RECOMMENDED	d PROJECTED - JAN. '78	d PLANT EXPANSIONS	e SEPARATIONS	e TRANSFERS OUT	TOTAL	e TRANSFERS IN	e NEW HIRES	TOTAL
TOTAL	2085		2365	280	183	306	769	306	463	769
SUPERVISORS	503		571	68	36	25	129	99	30	129
A	76		86	10	5	0	15	15	0	15
B	206		234	28	8	6	42	42	0	42
C	207		235	28	21	13	62	37	25	62
D	14		16	2	2	6	10	5	5	10
OPERATORS	1199		1361	162	111	240	513	166	347	513
A	14		16	2	1	3	6	6	0	6
B	368		418	50	15	28	93	84	9	93
C	635		721	86	64	103	253	76	177	253
D	182		206	24	31	106	161	0	161	161
LAB TECHNICIANS	150		169	19	13	20	52	20	32	52
A	10		11	1	1	0	2	2	0	2
B	70		79	9	3	2	14	12	2	14
C	47		53	6	5	10	21	6	15	21
D	23		26	3	4	8	15	0	15	15
MAINTENANCE	233		264	31	23	21	75	21	54	75
A	4		5	1	0	0	1	1	0	1
B	54		61	7	2	1	10	9	1	10
C	126		143	17	13	7	37	11	26	37
D	49		55	6	8	13	27	0	27	27

TEXAS MUNICIPAL WASTEWATER
TREATMENT PLANT CERTIFIED
PERSONNEL a

Analysis of Manpower Needs
For All Flow Sizes

	EMPLOYMENT			ACCESSIONS NEEDED				SOURCES OF ACCESSIONS		
					REPLACE LOSSES					
	b CURRENT - JAN.'78	c RECOMMENDED	d PROJECTED - JAN.'79	d PLANT EXPANSIONS	e SEPARATIONS	e TRANSFERS OUT	TOTAL	e TRANSFERS IN	e NEW HIRES	TOTAL
TOTAL	3674		3974	300	332	426	1058	426	632	1058
SUPERVISORS	1343		1423	80	119	45	244	175	69	244
A	100		110	10	7	0	17	17	0	17
B	405		436	31	23	7	61	61	0	61
C	710		745	35	80	24	139	83	56	139
D	128		132	4	9	14	27	14	13	27
OPERATORS	1774		1942	168	163	335	666	205	461	666
A	19		21	2	2	4	8	8	0	8
B	484		535	51	22	33	106	96	10	106
C	942		1031	89	98	149	336	101	235	336
D	329		355	26	41	149	216	0	216	216
LAB TECHNICIANS	182		201	19	14	20	53	20	33	53
A	11		12	1	0	0	1	1	0	1
B	84		93	9	4	1	14	13	1	14
C	58		64	6	5	10	21	6	15	21
D	29		32	3	5	9	17	0	17	17
MAINTENANCE	375		408	33	36	26	95	26	69	95
A	5		6	1	1	0	2	2	0	2
B	68		75	7	2	2	11	10	1	11
C	211		229	18	22	8	48	14	34	48
D	91		98	7	11	16	34	0	34	34

TEXAS MUNICIPAL WASTEWATER TREATMENT PLANT CERTIFIED PERSONNEL [a]

Analysis of Manpower Needs
(For Plants With Average
Flows of < 1MGD)

	EMPLOYMENT			ACCESSIONS NEEDED				SOURCES OF ACCESSIONS		
					REPLACE LOSSES					
	b CURRENT - JAN. '78	c RECOMMENDED	d PROJECTED - JAN. '79	d PLANT EXPANSIONS	e SEPARATIONS	e TRANSFERS OUT	TOTAL	e TRANSFERS IN	e NEW HIRES	TOTAL
TOTAL	1309		1329	20	128	110	258	110	148	258
SUPERVISORS	772		784	12	79	20	111	73	38	111
A	14		14	0	2	0	2	2	0	2
B	171		174	3	14	1	18	18	0	18
C	475		482	7	57	11	75	45	30	75
D	112		114	2	6	8	16	8	8	16
OPERATORS	413		419	6	39	87	132	34	98	132
A	3		3	0	1	1	2	2	0	2
B	66		67	1	6	4	11	10	1	11
C	221		224	3	26	43	72	22	50	72
D	123		125	2	6	39	47	0	47	47
LAB TECHNICIANS	13		13	0	1	1	2	1	1	2
A	0		0	0	0	0	0	0	0	0
B	5		5	0	1	0	1	1	0	1
C	5		5	0	0	1	1	0	1	1
D	3		3	0	0	0	0	0	0	0
MAINTENANCE	111		113	2	9	2	13	2	11	13
A	0		0	0	0	0	0	0	0	0
B	7		7	0	0	0	0	0	0	0
C	68		69	1	8	0	9	2	7	9
D	36		37	1	1	2	4	0	4	4

TEXAS MUNICIPAL WASTEWATER TREATMENT PLANT CERTIFIED PERSONNEL [a]

Analysis of Manpower Needs
(For Plants With Average Flows of >1MGD)

	EMPLOYMENT			ACCESSIONS NEEDED				SOURCES OF ACCESSIONS		
					REPLACE LOSSES					
	CURRENT - JAN. '78 [b]	RECOMMENDED [c]	PROJECTED - JAN. '79 [d]	PLANT EXPANSIONS [d]	SEPARATIONS [e]	TRANSFERS OUT [e]	TOTAL	TRANSFERS IN [e]	NEW HIRES [e]	TOTAL
TOTAL	2365		2645	280	204	316	800	316	484	800
SUPERVISORS	571		639	68	40	25	133	102	31	133
A	86		96	10	5	0	15	15	0	15
B	234		262	28	9	6	43	43	0	43
C	235		263	28	23	13	64	38	26	64
D	16		18	2	3	6	11	6	5	11
OPERATORS	1361		1523	162	124	248	534	171	363	534
A	16		18	2	1	3	6	6	0	6
B	418		468	50	16	29	95	86	9	95
C	721		807	86	72	106	264	79	185	264
D	206		230	24	35	110	169	0	169	169
LAB TECHNICIANS	169		188	19	13	19	51	19	32	51
A	11		12	1	0	0	1	1	0	1
B	79		88	9	3	1	13	12	1	13
C	53		59	6	5	9	20	6	14	20
D	26		29	3	5	9	17	0	17	17
MAINTENANCE	264		295	31	27	24	82	24	58	82
A	5		6	1	1	0	2	2	0	2
B	61		68	7	2	2	11	10	1	11
C	143		160	17	14	8	39	12	27	39
D	55		61	6	10	14	30	0	30	30

TEXAS MUNICIPAL WASTEWATER TREATMENT PLANT CERTIFIED PERSONNEL [a]

Analysis of Manpower Needs
For All Flow Sizes

	EMPLOYMENT				ACCESSIONS NEEDED			SOURCES OF ACCESSIONS		
					REPLACE LOSSES					
	CURRENT - JAN. '79 [b]	RECOMMENDED [c]	PROJECTED - JAN. '80 [d]	PLANT EXPANSIONS [d]	SEPARATIONS [e]	TRANSFERS OUT [e]	TOTAL	TRANSFERS IN [e]	NEW HIRES [e]	TOTAL
TOTAL	3974		4270	296	359	435	1090	435	655	1090
SUPERVISORS	1423		1499	76	124	45	245	176	69	245
A	110		120	10	7	0	17	17	0	17
B	436		465	29	25	7	61	61	0	61
C	745		779	34	84	23	141	85	56	141
D	132		135	3	8	15	26	13	13	26
OPERATORS	1942		2111	169	178	340	687	209	478	687
A	21		22	1	2	4	7	7	0	7
B	535		587	52	24	33	109	98	11	109
C	1031		1120	89	107	150	346	104	242	346
D	355		382	27	45	153	225	0	225	225
LAB TECHNICIANS	201		221	20	17	25	62	25	37	62
A	12		14	2	1	0	3	3	0	3
B	93		102	9	5	3	17	15	2	17
C	64		70	6	6	12	24	7	17	24
D	32		35	3	5	10	18	0	18	18
MAINTENANCE	408		439	31	40	25	96	25	71	96
A	6		6	0	1	0	1	1	0	1
B	75		82	7	3	1	11	10	1	11
C	229		246	17	24	8	49	14	35	49
D	98		105	7	12	16	35	0	35	35

TEXAS MUNICIPAL WASTEWATER
TREATMENT PLANT CERTIFIED
PERSONNEL a

Analysis of Manpower Needs

(For Plants With Average
Flows of < 1MGD)

	EMPLOYMENT			ACCESSIONS NEEDED				SOURCES OF ACCESSIONS		
					REPLACE LOSSES					
	CURRENT - JAN. '79 b	RECOMMENDED c	PROJECTED - JAN. '80 d	PLANT EXPANSIONS d	SEPARATIONS e	TRANSFERS OUT e	TOTAL	TRANSFERS IN c	NEW HIRES e	TOTAL
TOTAL	1329		1346	17	129	107	253	107	146	253
SUPERVISORS	784		794	10	79	19	108	71	37	108
A	14		14	0	2	0	2	2	0	2
B	174		176	2	14	1	17	17	0	17
C	482		489	7	58	10	75	45	30	75
D	114		115	1	5	8	14	7	7	14
OPERATORS	419		425	6	39	85	130	33	97	130
A	3		3	0	1	1	2	2	0	2
B	67		68	1	5	4	10	9	1	10
C	224		227	3	27	42	72	22	50	72
D	125		127	2	6	38	46	0	46	46
LAB TECHNICIANS	13		13	0	1	1	2	1	1	2
A	0		0	0	0	0	0	0	0	0
B	5		5	0	1	0	1	1	0	1
C	5		5	0	0	1	1	0	1	1
D	3		3	0	0	0	0	0	0	0
MAINTENANCE	113		114	1	10	2	13	2	11	13
A	0		0	0	0	0	0	0	0	0
B	7		7	0	0	0	0	0	0	0
C	69		70	1	8	0	9	2	7	9
D	37		37	0	2	2	4	0	4	4

TEXAS MUNICIPAL WASTEWATER TREATMENT PLANT CERTIFIED PERSONNEL a

Analysis of Manpower Needs
(For Plants With Average Flows of $\geq$ 1MGD)

	EMPLOYMENT			ACCESSIONS NEEDED				SOURCES OF ACCESSIONS		
					REPLACE LOSSES					
	CURRENT - JAN. '79 b	RECOMMENDED c	PROJECTED - JAN. '80 d	PLANT EXPANSIONS d	SEPARATIONS e	TRANSFERS OUT e	TOTAL	TRANSFERS IN e	NEW HIRES e	TOTAL
TOTAL	2645		2924	279	230	328	837	328	509	837
SUPERVISORS	639		705	66	45	26	137	105	32	137
A	96		106	10	5	0	15	15	0	15
B	262		289	27	11	6	44	44	0	44
C	263		290	27	26	13	66	40	26	66
D	18		20	2	3	7	12	6	6	12
OPERATORS	1523		1686	163	139	255	557	176	381	557
A	18		19	1	1	3	5	5	0	5
B	468		519	51	19	29	99	89	10	99
C	807		893	86	80	108	274	82	192	274
D	230		255	25	39	115	179	0	179	179
LAB TECHNICIANS	188		208	20	16	24	60	24	36	60
A	12		14	2	1	0	3	3	0	3
B	88		97	9	4	3	16	14	2	16
C	59		65	6	6	11	23	7	16	23
D	29		32	3	5	10	18	0	18	18
MAINTENANCE	295		325	30	30	23	83	23	60	83
A	6		6	0	1	0	1	1	0	1
B	68		75	7	3	1	11	10	1	11
C	160		176	16	16	8	40	12	28	40
D	61		68	7	10	14	31	0	31	31

TEXAS MUNICIPAL WASTEWATER TREATMENT PLANT CERTIFIED PERSONNEL [a]

Analysis of Manpower Needs

(For All Flow Sizes)

	EMPLOYMENT			ACCESSIONS NEEDED				SOURCES OF ACCESSIONS		
					REPLACE LOSSES					
	[b] CURRENT - JAN. '80	[c] RECOMMENDED	[d] PROJECTED - JAN. '81	[d] PLANT EXPANSIONS	[e] SEPARATIONS	[e] TRANSFERS OUT	TOTAL	[e] TRANSFERS IN	[e] NEW HIRES	TOTAL
TOTAL	4270		4576	306	389	460	1155	460	695	1155
SUPERVISORS	1499		1578	79	134	47	260	187	73	260
A	120		132	12	9	0	21	21	0	21
B	465		494	29	26	8	63	63	0	63
C	779		814	35	89	24	148	89	59	148
D	135		138	3	10	15	28	14	14	28
OPERATORS	2111		2282	171	196	363	730	223	507	730
A	22		24	2	1	5	8	8	0	8
B	587		639	52	27	36	115	104	11	115
C	1120		1211	91	118	159	368	111	257	368
D	382		408	26	50	163	239	0	239	239
LAB TECHNICIANS	221		243	22	15	24	61	24	37	61
A	14		16	2	0	0	2	2	0	2
B	102		13	11	4	2	17	15	2	17
C	70		76	6	8	12	26	7	19	26
D	35		38	3	3	10	16	0	16	16
MAINTENANCE	439		473	34	44	26	104	26	78	104
A	6		6	0	0	0	0	0	0	0
B	82		91	9	3	0	12	11	1	12
C	246		263	17	27	9	53	15	38	53
D	105		113	8	14	17	39	0	39	39

TEXAS MUNICIPAL WASTEWATER
TREATMENT PLANT CERTIFIED
PERSONNEL a

Analysis of Manpower Needs

(For Plants With Average
Flows of < 1MGD)

	EMPLOYMENT			ACCESSIONS NEEDED				SOURCES OF ACCESSIONS		
					REPLACE LOSSES					
	b CURRENT - JAN. '80	c RECOMMENDED	d PROJECTED - JAN. '81	d PLANT EXPANSIONS	e SEPARATIONS	e TRANSFERS OUT	TOTAL	e TRANSFERS IN	e NEW HIRES	TOTAL
TOTAL	1346		1369	23	135	113	271	113	158	271
SUPERVISORS	794		806	12	81	19	112	73	39	112
A	14		15	1	2	0	3	3	0	3
B	176		178	2	14	1	17	17	0	17
C	489		497	8	59	10	77	46	31	77
D	115		116	1	6	8	15	7	8	15
OPERATORS	425		432	7	41	90	138	36	102	138
A	3		4	1	0	1	2	2	0	2
B	68		69	1	6	5	12	11	1	12
C	227		231	4	28	44	76	23	53	76
D	127		128	1	7	40	48	0	48	48
LAB TECHNICIANS	13		14	1	2	1	4	1	3	4
A	0		0	0	0	0	0	0	0	0
B	5		6	1	0	0	1	1	0	1
C	5		5	0	1	1	2	0	2	2
D	3		3	0	1	0	1	0	1	1
MAINTENANCE	114		117	3	11	3	17	3	14	17
A	0		0	0	0	0	0	0	0	0
B	7		8	1	0	0	1	1	0	1
C	70		71	1	9	1	11	2	9	11
D	37		38	1	2	2	5	0	5	5

TEXAS MUNICIPAL WASTEWATER TREATMENT PLANT CERTIFIED PERSONNEL a

Analysis of Manpower Needs

(For Plants With Average Flows of >1MGD)

	EMPLOYMENT			ACCESSIONS NEEDED				SOURCES OF ACCESSIONS		
					REPLACE LOSSES					
	b CURRENT - JAN. '80	c RECOMMENDED	d PROJECTED - JAN. '81	d PLANT EXPANSIONS	e SEPARATIONS	e TRANSFERS OUT	TOTAL	e TRANSFERS IN	e NEW HIRES	TOTAL
TOTAL	2924		3207	283	254	347	884	347	537	884
SUPERVISORS	705		772	67	53	28	148	114	34	148
A	106		117	11	7	0	18	18	0	18
B	289		316	27	12	7	46	46	0	46
C	290		317	27	30	14	71	43	28	71
D	20		22	2	4	7	13	7	6	13
OPERATORS	1686		1850	164	155	273	592	187	405	592
A	19		20	1	1	4	6	6	0	6
B	519		570	51	21	31	103	93	10	103
C	893		980	87	90	115	292	88	204	292
D	255		280	25	43	123	191	0	191	191
LAB TECHNICIANS	208		229	21	13	23	57	23	34	57
A	14		16	2	0	0	2	2	0	2
B	97		107	10	4	2	16	14	2	16
C	65		71	6	7	11	24	7	17	24
D	32		35	3	2	10	15	0	15	15
MAINTENANCE	325		356	31	33	23	87	23	64	87
A	6		6	0	0	0	0	0	0	0
B	75		83	8	3	0	11	10	1	11
C	176		192	16	18	8	42	13	29	42
D	68		75	7	12	15	34	0	34	34

TAB A

EXHIBIT 2 - TRAINING LOADS

(See Tab B, Exhibit 1, for explanation)

TEXAS MUNICIPAL WASTEWATER
TREATMENT PLANT CERTIFIED
PERSONNEL

Analysis of Training Loads[g]
For All Flow Sizes

Jan. '76-Jan. '81
(Five Year Total)

	PERSONNEL REQUIRING TRAINING				STUDENT HOURS REQUIRED			
	ENTRY	UPDATE	UPGRADE	TOTAL	ENTRY	UPDATE	UPGRADE	TOTAL
TOTAL	3,170	15,031	1,668	19,869	77,365	127,006	62,875	267,246
SUPERVISORS	342	6,353[h]	411[h]	7,106	9,285	48,298	17,730	75,313
A	0	485	67	552	0	0	5,360	5,360
B	0	1,968	206	2,174	0	21,890	10,300	32,190
C	277	3,308	138	3,723	8,310	23,468	2,070	33,848
D	65	592	0	657	975	2,940	0	3,915
OPERATORS	2,311	6,381	1,023	9,715	55,670	59,664	36,170	151,504
A	0	66	37	103	0	0	2,960	2,960
B	52	2,146	480	2,678	4,160	25,850	25,620	55,630
C	1,175	3,476	506	5,157	35,250	29,279	7,590	72,119
D	1,084	693	0	1,777	16,260	4,535	0	20,795
LAB TECHNICIANS	170	731	109	1,010	4,285	6,504	4,840	15,629
A	0	53	10	63	0	0	800	800
B	8	392	67	467	640	4,410	3,560	8,610
C	81	207	32	320	2,430	1,634	480	4,544
D	81	79	0	160	1,215	460	0	1,675
MAINTENANCE	347	1,566	125	2,038	8,125	12,540	4,135	24,800
A	0	22	5	27	0	0	400	400
B	5	321	51	377	400	3,780	2,700	6,880
C	173	900	69	1,142	5,190	6,900	1,035	13,125
D	169	323	0	492	2,535	1,860	0	4,395

TEXAS MUNICIPAL WASTEWATER TREATMENT PLANT CERTIFIED PERSONNEL

Analysis of Training Loads[g]
(For Plants With Average Flows of < 1MGD)
Jan. '76 - Jan. '81
(Five Year Total)

	PERSONNEL REQUIRING TRAINING				STUDENT HOURS REQUIRED			
	ENTRY	UPDATE	UPGRADE	TOTAL	ENTRY	UPDATE	UPGRADE	TOTAL
TOTAL	740	5,568	335	6,643	18,070	44,258	10,580	72,908
SUPERVISORS	187	3,573[h]	156[h]	3,916	5,040	27,661	5,390	38,091
A	0	65	6	71	0	0	480	480
B	0	791	76	867	0	9,280	3,800	13,080
C	149	2,188	74	2,411	4,470	15,661	1,110	21,241
D	38	529	0	567	570	2,720	0	3,290
OPERATORS	486	1,447	163	2,096	11,350	12,578	4,740	28,668
A	0	8	8	16	0	0	640	640
B	5	284	46	335	400	3,440	2,465	6,305
C	249	763	109	1,121	7,470	6,773	1,635	15,878
D	232	392	0	624	3,480	2,365	0	5,845
LAB TECHNICIANS	7	56	3	66	195	521	150	866
A	0	0	0	0	0	0	0	0
B	0	23	3	26	0	290	150	440
C	6	19	0	25	180	161	0	341
D	1	14	0	15	15	70	0	85
MAINTENANCE	60	492	13	565	1,485	3,498	300	5,283
A	0	0	0	0	0	0	0	0
B	0	33	3	36	0	340	150	490
C	39	296	10	345	1,170	2,273	150	3,593
D	21	163	0	184	315	885	0	1,200

TEXAS MUNICIPAL WASTEWATER TREATMENT PLANT CERTIFIED PERSONNEL

Analysis of Training Loads[g]
(For Plants With Average Flows of ≥ 1MGD)

Jan. '76 - Jan. '81
(Five Year Total)

	PERSONNEL REQUIRING TRAINING				STUDENT HOURS REQUIRED			
	ENTRY	UPDATE	UPGRADE	TOTAL	ENTRY	UPDATE	UPGRADE	TOTAL
TOTAL	2,430	9,463	1,333	13,226	59,295	82,748	52,295	194,338
SUPERVISORS	155	2,780[h]	255[h]	3,190	4,245	20,637	12,340	37,222
A	0	420	61	481	0	0	4,880	4,880
B	0	1,177	130	1,307	0	12,610	6,500	19,110
C	128	1,120	64	1,312	3,840	7,807	960	12,607
D	27	63	0	90	405	220	0	625
OPERATORS	1,825	4,934	860	7,619	44,320	47,086	31,430	122,836
A	0	58	29	87	0	0	2,320	2,320
B	47	1,862	434	2,343	3,760	22,410	23,155	49,325
C	926	2,713	397	4,036	27,780	22,506	5,955	56,241
D	852	301	0	1,153	12,780	2,170	0	14,950
LAB TECHNICIANS	163	675	106	944	4,090	5,983	4,690	14,763
A	0	53	10	63	0	0	800	800
B	8	369	64	441	640	4,120	3,410	8,170
C	75	188	32	295	2,250	1,473	480	4,203
D	80	65	0	145	1,200	390	0	1,590
MAINTENANCE	287	1,074	112	1,473	6,640	9,042	3,835	19,517
A	0	22	5	27	0	0	400	400
B	5	288	48	341	400	3,440	2,550	6,390
C	134	604	59	797	4,020	4,627	885	9,532
D	148	160	0	308	2,220	975	0	3,195

TEXAS MUNICIPAL WASTEWATER TREATMENT PLANT CERTIFIED PERSONNEL

Analysis of Training Loads[g]
For All Flow Sizes

Jan. '76 - Jan. '77

	PERSONNEL REQUIRING TRAINING				STUDENT HOURS REQUIRED			
	ENTRY	UPDATE	UPGRADE	TOTAL	ENTRY	UPDATE	UPGRADE	TOTAL
TOTAL	580	2,484	311	3,375	14,190	31,216	11,755	57,161
SUPERVISORS	64	1,122[h]	77[h]	1,263	1,740	12,900	3,300	17,940
A	0	78	12	90	0	0	960	960
B	0	335	39	374	0	5,710	1,950	7,660
C	52	597	26	675	1,560	6,420	390	8,370
D	12	112	0	124	180	770	0	950
OPERATORS	423	993	190	1,606	10,235	13,976	6,755	30,966
A	0	10	7	17	0	0	560	560
B	10	333	90	433	800	5,890	4,800	11,490
C	216	544	93	853	6,480	7,026	1,395	14,901
D	197	106	0	303	2,955	1,060	0	4,015
LAB TECHNICIANS	30	113	20	163	725	1,367	895	2,987
A	0	8	2	10	0	0	160	160
B	1	62	12	75	80	900	645	1,625
C	14	32	6	52	420	387	90	897
D	15	11	0	26	225	80	0	305
MAINTENANCE	63	256	24	343	1,490	2,973	805	5,268
A	0	3	1	4	0	0	80	80
B	1	50	10	61	80	900	530	1,510
C	32	148	13	193	960	1,633	195	2,788
D	30	55	0	85	450	440	0	890

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TEXAS MUNICIPAL WASTEWATER
TREATMENT PLANT CERTIFIED
PERSONNEL

Analysis of Training Loads[g]
(For Plants With Average
Flows of <1MGD)

Jan. '76 - Jan. '77

	PERSONNEL REQUIRING TRAINING				STUDENT HOURS REQUIRED			
	ENTRY	UPDATE	UPGRADE	TOTAL	ENTRY	UPDATE	UPGRADE	TOTAL
TOTAL	143	1,084	63	1,290	3,500	12,836	1,945	18,281
SUPERVISORS	36	694[h]	30[h]	760	975	8,240	1,040	10,255
A	0	13	1	14	0	0	80	80
B	0	153	15	168	0	2,920	750	3,670
C	29	425	14	468	870	4,600	210	5,680
D	7	103	0	110	105	720	0	825
OPERATORS	94	283	30	407	2,195	3,488	825	6,508
A	0	2	1	3	0	0	80	80
B	1	56	8	65	80	1,040	430	1,550
C	48	149	21	218	1,440	1,833	315	3,588
D	45	76	0	121	675	615	0	1,290
LAB TECHNICIANS	1	12	0	13	30	175	0	205
A	0	0	0	0	0	0	0	0
B	0	5	0	5	0	100	0	100
C	1	4	0	5	30	60	0	90
D	0	3	0	3	0	15	0	15
MAINTENANCE	12	95	3	110	300	933	80	1,313
A	0	0	0	0	0	0	0	0
B	0	6	1	7	0	60	50	110
C	8	57	2	67	240	653	30	923
D	4	32	0	36	60	220	0	280

TEXAS MUNICIPAL WASTEWATER TREATMENT PLANT CERTIFIED PERSONNEL

Analysis of Training Loads [g]
(For Plants With Average
Flows of ≥1MGD)

Jan. '76 - Jan.'77

	PERSONNEL REQUIRING TRAINING				STUDENT HOURS REQUIRED			
	ENTRY	UPDATE	UPGRADE	TOTAL	ENTRY	UPDATE	UPGRADE	TOTAL
TOTAL	437	1,400	248	2,085	10,690	18,380	9,810	38,880
SUPERVISORS	28	428[h]	47[h]	503	765	4,660	2,260	7,685
A	0	65	11	76	0	0	880	880
B	0	182	24	206	0	2,790	1,200	3,990
C	23	172	12	207	690	1,820	180	2,690
D	5	9	0	14	75	50	0	125
OPERATORS	329	710	160	1,199	8,040	10,488	5,930	24,458
A	0	8	6	14	0	0	480	480
B	9	277	82	368	720	4,850	4,370	9,940
C	168	395	72	635	5,040	5,193	1,080	11,313
D	152	30	0	182	2,280	445	0	2,725
LAB TECHNICIANS	29	101	20	150	695	1,192	895	2,782
A	0	8	2	10	0	0	160	160
B	1	57	12	70	80	800	645	1,525
C	13	28	6	47	390	327	90	807
D	15	8	0	23	225	65	0	290
MAINTENANCE	51	161	21	233	1,190	2,040	725	3,955
A	0	3	1	4	0	0	80	80
B	1	44	9	54	80	840	480	1,400
C	24	91	11	126	720	980	165	1,865
D	26	23	0	49	390	220	0	610

TEXAS MUNICIPAL WASTEWATER TREATMENT PLANT CERTIFIED PERSONNEL

Analysis of Training Loads[g]
For All Flow Sizes

Jan. '77 - Jan. '78

	PERSONNEL REQUIRING TRAINING				STUDENT HOURS REQUIRED			
	ENTRY	UPDATE	UPGRADE	TOTAL	ENTRY	UPDATE	UPGRADE	TOTAL
TOTAL	608	2,745	321	3,674	14,900	21,062	12,110	48,072
SUPERVISORS	67	1,195[h]	81[h]	1,343	1,815	8,094	3,495	13,404
A	0	87	13	100	0	0	1,040	1,040
B	0	364	41	405	0	3,620	2,050	5,670
C	54	629	27	710	1,620	3,954	405	5,979
D	13	115	0	128	195	520	0	715
OPERATORS	442	1,136	196	1,774	10,655	9,793	6,930	27,378
A	0	12	7	19	0	0	560	560
B	10	382	92	484	800	4,260	4,915	9,975
C	225	620	97	942	6,750	4,793	1,455	12,998
D	207	122	0	329	3,105	740	0	3,845
LAB TECHNICIANS	33	129	20	182	865	1,090	880	2,835
A	0	9	2	11	0	0	160	160
B	2	70	12	84	160	750	630	1,540
C	16	36	6	58	480	260	90	830
D	15	14	0	29	225	80	0	305
MAINTENANCE	66	285	24	375	1,565	2,085	805	4,455
A	0	4	1	5	0	0	80	80
B	1	57	10	68	80	610	530	1,220
C	34	164	13	211	1,020	1,160	195	2,375
D	31	60	0	91	465	315	0	780

TEXAS MUNICIPAL WASTEWATER TREATMENT PLANT CERTIFIED PERSONNEL

Analysis of Training Loads[g]
(For Plants With Average Flows of <1MGD)

Jan. '77 - Jan. '78

	PERSONNEL REQUIRING TRAINING				STUDENT HOURS REQUIRED			
	ENTRY	UPDATE	UPGRADE	TOTAL	ENTRY	UPDATE	UPGRADE	TOTAL
TOTAL	145	1,100	64	1,309	3,530	7,707	1,960	13,197
SUPERVISORS	37	704[h]	31[h]	772	990	4,752	1,055	6,797
A	0	13	1	14	0	0	80	80
B	0	156	15	171	0	1,560	750	2,310
C	29	431	15	475	870	2,707	225	3,802
D	8	104	0	112	120	485	0	605
OPERATORS	95	288	30	413	2,210	2,250	825	5,285
A	0	2	1	3	0	0	80	80
B	1	57	8	66	80	600	430	1,110
C	48	152	21	221	1,440	1,220	315	2,975
D	46	77	0	123	690	430	0	1,120
LAB TECHNICIANS	1	12	0	13	30	92	0	122
A	0	0	0	0	0	0	0	0
B	0	5	0	5	0	50	0	50
C	1	4	0	5	30	27	0	57
D	0	3	0	3	0	15	0	15
MAINTENANCE	12	96	3	111	300	613	80	993
A	0	0	0	0	0	0	0	0
B	0	6	1	7	0	60	50	110
C	8	58	2	68	240	393	30	663
D	4	32	0	36	60	160	0	220

TEXAS MUNICIPAL WASTEWATER TREATMENT PLANT CERTIFIED PERSONNEL

Analysis of Training Loads[g]
(For Plants With Average
Flows of ≥1MGD)

Jan. '77 - Jan. '78

	PERSONNEL REQUIRING TRAINING				STUDENT HOURS REQUIRED			
	ENTRY	UPDATE	UPGRADE	TOTAL	ENTRY	UPDATE	UPGRADE	TOTAL
TOTAL	463	1,645	257	2,365	11,370	13,355	10,150	34,875
SUPERVISORS	30	[h] 491	[h] 50	571	825	3,342	2,440	6,607
A	0	74	12	86	0	0	960	960
B	0	208	26	234	0	2,060	1,300	3,360
C	25	198	12	235	750	1,247	180	2,177
D	5	11	0	16	75	35	0	110
OPERATORS	347	848	166	1,361	8,445	7,543	6,105	22,093
A	0	10	6	16	0	0	480	480
B	9	325	84	418	720	3,660	4,485	8,865
C	177	468	76	721	5,310	3,573	1,140	10,023
D	161	45	0	206	2,415	310	0	2,725
LAB TECHNICIANS	32	117	20	169	835	998	880	2,713
A	0	9	2	11	0	0	160	160
B	2	65	12	79	160	700	630	1,490
C	15	32	6	53	450	233	90	773
D	15	11	0	26	225	65	0	290
MAINTENANCE	54	189	21	264	1,265	1,472	725	3,462
A	0	4	1	5	0	0	80	80
B	1	51	9	61	80	550	480	1,110
C	26	106	11	143	780	767	165	1,712
D	27	28	0	55	405	155	0	560

TEXAS MUNICIPAL WASTEWATER TREATMENT PLANT CERTIFIED PERSONNEL

Analysis of Training Loads[g]
For All Flow Sizes

Jan. '78 - Jan. '79

	PERSONNEL REQUIRING TRAINING				STUDENT HOURS REQUIRED			
	ENTRY	UPDATE	UPGRADE	TOTAL	ENTRY	UPDATE	UPGRADE	TOTAL
TOTAL	632	3,009	333	3,974	15,360	23,008	12,580	50,948
SUPERVISORS	69	1,272[h]	82[h]	1,423	1,875	8,605	3,545	14,025
A	0	97	13	110	0	0	1,040	1,040
B	0	394	42	436	0	3,910	2,100	6,010
C	56	662	27	745	1,680	4,160	405	6,245
D	13	119	0	132	195	535	0	730
OPERATORS	461	1,276	205	1,942	11,090	10,877	7,270	29,237
A	0	13	8	21	0	0	640	640
B	10	429	96	535	800	4,740	5,115	10,655
C	235	695	101	1,031	7,050	5,307	1,515	13,872
D	216	139	0	355	3,240	830	0	4,070
LAB TECHNICIANS	33	148	20	201	785	1,232	865	2,882
A	0	11	1	12	0	0	80	80
B	1	79	13	93	80	840	695	1,615
C	15	43	6	64	450	307	90	847
D	17	15	0	32	255	85	0	340
MAINTENANCE	69	313	26	408	1,610	2,294	900	4,804
A	0	4	2	6	0	0	160	160
B	1	64	10	75	80	680	530	1,290
C	34	181	14	229	1,020	1,274	210	2,504
D	34	64	0	98	510	340	0	850

TEXAS MUNICIPAL WASTEWATER
TREATMENT PLANT CERTIFIED
PERSONNEL

Analysis of Training Loads [9]
(For Plants With Average
Flows of <1MGD)

Jan. '78 - Jan. '79

	PERSONNEL REQUIRING TRAINING				STUDENT HOURS REQUIRED			
	ENTRY	UPDATE	UPGRADE	TOTAL	ENTRY	UPDATE	UPGRADE	TOTAL
TOTAL	148	1,112	69	1,329	3,605	7,796	2,205	13,606
SUPERVISORS	38	h 714	h 32	784	1,020	4,815	1,105	6,940
A	0	13	1	14	0	0	80	80
B	0	158	16	174	0	1,580	800	2,380
C	30	437	15	482	900	2,740	225	3,865
D	8	106	0	114	120	495	0	615
OPERATORS	98	287	34	419	2,285	2,252	1,020	5,557
A	0	1	2	3	0	0	160	160
B	1	56	10	67	80	590	530	1,200
C	50	152	22	224	1,500	1,227	330	3,057
D	47	78	0	125	705	435	0	1,140
LAB TECHNICIANS	1	11	1	13	30	82	50	162
A	0	0	0	0	0	0	0	0
B	0	4	1	5	0	40	50	90
C	1	4	0	5	30	27	0	57
D	0	3	0	3	0	15	0	15
MAINTENANCE	11	100	2	113	270	647	30	947
A	0	0	0	0	0	0	0	0
B	0	7	0	7	0	70	0	70
C	7	60	2	69	210	407	30	647
D	4	33	0	37	60	170	0	230

TEXAS MUNICIPAL WASTEWATER TREATMENT PLANT CERTIFIED PERSONNEL

Analysis of Training Loads[g]
(For Plants With Average Flows of ≥1MGD)

Jan. '78 - Jan. '79

	PERSONNEL REQUIRING TRAINING				STUDENT HOURS REQUIRED			
	ENTRY	UPDATE	UPGRADE	TOTAL	ENTRY	UPDATE	UPGRADE	TOTAL
TOTAL	484	1,897	264	2,645	11,755	15,212	10,375	37,342
SUPERVISORS	31	[h] 558	[h] 50	639	855	3,790	2,440	7,085
A	0	84	12	96	0	0	960	960
B	0	236	26	262	0	2,330	1,300	3,630
C	26	225	12	263	780	1,420	180	2,380
D	5	13	0	18	75	40	0	115
OPERATORS	363	989	171	1,523	8,805	8,625	6,250	23,680
A	0	12	6	18	0	0	480	480
B	9	373	86	468	720	4,150	4,585	9,455
C	185	543	79	807	5,550	4,080	1,185	10,815
D	169	61	0	230	2,535	395	0	2,930
LAB TECHNICIANS	32	137	19	188	755	1,150	815	2,720
A	0	11	1	12	0	0	80	80
B	1	75	12	88	80	800	645	1,525
C	14	39	6	59	420	280	90	790
D	17	12	0	29	255	70	0	325
MAINTENANCE	58	213	24	295	1,340	1,647	870	3,857
A	0	4	2	6	0	0	160	160
B	1	57	10	68	80	610	530	1,220
C	27	121	12	160	810	867	180	1,857
D	30	31	0	61	450	170	0	620

TEXAS MUNICIPAL WASTEWATER TREATMENT PLANT CERTIFIED PERSONNEL

Analysis of Training Loads[g]

For All Flow Sizes
Jan. '79 - Jan. '80

	PERSONNEL REQUIRING TRAINING				STUDENT HOURS REQUIRED			
	ENTRY	UPDATE	UPGRADE	TOTAL	ENTRY	UPDATE	UPGRADE	TOTAL
TOTAL	655	3,273	342	4,270	15,985	24,931	12,835	53,751
SUPERVISORS	69	1,347[h]	83[h]	1,499	1,875	9,119	3,525	14,519
A	0	107	13	120	0	0	1,040	1,040
B	0	424	41	465	0	4,190	2,050	6,240
C	56	694	29	779	1,680	4,374	435	6,489
D	13	122	0	135	195	555	0	750
OPERATORS	478	1,424	209	2,111	11,515	11,997	7,350	30,862
A	0	15	7	22	0	0	560	560
B	11	478	98	587	880	5,250	5,230	11,360
C	242	774	104	1,120	7,260	5,827	1,560	14,647
D	225	157	0	382	3,375	920	0	4,295
LAB TECHNICIANS	37	159	25	221	940	1,322	1,140	3,402
A	0	11	3	14	0	0	240	240
B	2	85	15	102	160	900	795	1,855
C	17	46	7	70	510	327	105	942
D	18	17	0	35	270	95	0	365
MAINTENANCE	71	343	25	439	1,655	2,493	820	4,968
A	0	5	1	6	0	0	80	80
B	1	71	10	82	80	750	530	1,360
C	35	197	14	246	1,050	1,373	210	2,633
D	35	70	0	105	525	370	0	895

TEXAS MUNICIPAL WASTEWATER TREATMENT PLANT CERTIFIED PERSONNEL

Analysis of Training Loads[g]
(For Plants With Average Flows of < 1MGD)
Jan. '79 - Jan. '80

	PERSONNEL REQUIRING TRAINING				STUDENT HOURS REQUIRED			
	ENTRY	UPDATE	UPGRADE	TOTAL	ENTRY	UPDATE	UPGRADE	TOTAL
TOTAL	146	1,133	67	1,346	3,575	7,922	2,105	13,602
SUPERVISORS	37	726[h]	31[h]	794	1,005	4,897	1,055	6,957
A	0	13	1	14	0	0	80	80
B	0	161	15	176	0	1,600	750	2,350
C	30	444	15	489	900	2,787	225	3,912
D	7	108	0	115	105	510	0	615
OPERATORS	97	295	33	425	2,270	2,295	970	5,535
A	0	1	2	3	0	0	160	160
B	1	58	9	68	80	610	480	1,170
C	50	155	22	227	1,500	1,240	330	3,070
D	46	81	0	127	690	445	0	1,135
LAB TECHNICIANS	1	11	1	13	30	82	50	162
A	0	0	0	0	0	0	0	0
B	0	4	1	5	0	40	50	90
C	1	4	0	5	30	27	0	57
D	0	3	0	3	0	15	0	15
MAINTENANCE	11	101	2	114	270	648	30	948
A	0	0	0	0	0	0	0	0
B	0	7	0	7	0	70	0	70
C	7	61	2	70	210	413	30	653
D	4	33	0	37	60	165	0	225

TEXAS MUNICIPAL WASTEWATER TREATMENT PLANT CERTIFIED PERSONNEL

Analysis of Training Loads[g]
(For Plants With Average Flows of ≥ 1MGD)
Jan. '79 - Jan. '80

	PERSONNEL REQUIRING TRAINING				STUDENT HOURS REQUIRED			
	ENTRY	UPDATE	UPGRADE	TOTAL	ENTRY	UPDATE	UPGRADE	TOTAL
TOTAL	509	2,140	275	2,924	12,410	17,009	10,730	40,149
SUPERVISORS	32	621[h]	52[h]	705	870	4,222	2,470	7,562
A	0	94	12	106	0	0	960	960
B	0	263	26	289	0	2,590	1,300	3,890
C	26	250	14	290	780	1,587	210	2,577
D	6	14	0	20	90	45	0	135
OPERATORS	381	1,129	176	1,686	9,245	9,702	6,380	25,327
A	0	14	5	19	0	0	400	400
B	10	420	89	519	800	4,640	4,750	10,190
C	192	619	82	893	5,760	4,587	1,230	11,577
D	179	76	0	255	2,685	475	0	3,160
LAB TECHNICIANS	36	148	24	208	910	1,240	1,090	3,240
A	0	11	3	14	0	0	240	240
B	2	81	14	97	160	860	745	1,765
C	16	42	7	65	480	300	105	885
D	18	14	0	32	270	80	0	350
MAINTENANCE	60	242	23	325	1,385	1,845	790	4,020
A	0	5	1	6	0	0	80	80
B	1	64	10	75	80	680	530	1,290
C	28	136	12	176	840	960	180	1,980
D	31	37	0	68	465	205	0	670

TEXAS MUNICIPAL WASTEWATER TREATMENT PLANT CERTIFIED PERSONNEL

Analysis of Training Loads[g]
(For All Flow Sizes)

Jan. '80 - Jan. '81

	PERSONNEL REQUIRING TRAINING				STUDENT HOURS REQUIRED			
	ENTRY	UPDATE	UPGRADE	TOTAL	ENTRY	UPDATE	UPGRADE	TOTAL
TOTAL	695	3,520	361	4,576	16,930	26,789	13,595	57,314
SUPERVISORS	73	1,417[h]	88[h]	1,578	1,980	9,580	3,865	15,425
A	0	116	16	132	0	0	1,280	1,280
B	0	451	43	494	0	4,460	2,150	6,610
C	59	726	29	814	1,770	4,560	435	6,765
D	14	124	0	138	210	560	0	770
OPERATORS	507	1,552	223	2,282	12,175	13,021	7,865	33,061
A	0	16	8	24	0	0	640	640
B	11	524	104	639	880	5,710	5,560	12,150
C	257	843	111	1,211	7,710	6,326	1,665	15,701
D	239	169	0	408	3,585	985	0	4,570
LAB TECHNICIANS	37	182	24	243	970	1,493	1,060	3,523
A	0	14	2	16	0	0	160	160
B	2	96	15	113	160	1,020	795	1,975
C	19	50	7	76	570	353	105	1,028
D	16	22	0	38	240	120	0	360
MAINTENANCE	78	369	26	473	1,805	2,695	805	5,305
A	0	6	0	6	0	0	0	0
B	1	79	11	91	80	840	580	1,500
C	38	210	15	263	1,140	1,460	225	2,825
D	39	74	0	113	585	395	0	980

TEXAS MUNICIPAL WASTEWATER
TREATMENT PLANT CERTIFIED
PERSONNEL

Analysis of Training Loads [g]
(For Plants With Average
Flows of <1MGD)

Jan. '80 - Jan. '81

	PERSONNEL REQUIRING TRAINING				STUDENT HOURS REQUIRED			
	ENTRY	UPDATE	UPGRADE	TOTAL	ENTRY	UPDATE	UPGRADE	TOTAL
TOTAL	158	1,139	72	1,369	3,860	7,997	2,365	14,222
SUPERVISORS	39	[h] 735	[h] 32	806	1,050	4,957	1,135	7,142
A	0	13	2	15	0	0	160	160
B	0	163	15	178	0	1,620	750	2,370
C	31	451	15	497	930	2,827	225	3,982
D	8	108	0	116	120	510	0	630
OPERATORS	102	294	36	432	2,390	2,293	1,100	5,783
A	0	2	2	4	0	0	160	160
B	1	57	11	69	80	600	595	1,275
C	53	155	23	231	1,590	1,253	345	3,188
D	48	80	0	128	720	440	0	1,160
LAB TECHNICIANS	3	10	1	14	75	90	50	215
A	0	0	0	0	0	0	0	0
B	0	5	1	6	0	60	50	110
C	2	3	0	5	60	20	0	80
D	1	2	0	3	15	10	0	25
MAINTENANCE	14	100	3	117	345	657	80	1,082
A	0	0	0	0	0	0	0	0
B	0	7	1	8	0	80	50	130
C	9	60	2	71	270	407	30	707
D	5	33	0	38	75	170	0	245

TEXAS MUNICIPAL WASTEWATER TREATMENT PLANT CERTIFIED PERSONNEL

Analysis of Training Loads [g]
(For Plants With Average Flows of $\geq$1MGD)

Jan. '80 - Jan. '81

	PERSONNEL REQUIRING TRAINING				STUDENT HOURS REQUIRED			
	ENTRY	UPDATE	UPGRADE	TOTAL	ENTRY	UPDATE	UPGRADE	TOTAL
TOTAL	537	2,381	289	3,207	13,070	18,792	11,230	43,092
SUPERVISORS	34	[h] 682	[h] 56	772	930	4,623	2,730	8,283
A	0	103	14	117	0	0	1,120	1,120
B	0	288	28	316	0	2,840	1,400	4,240
C	28	275	14	317	840	1,733	210	2,783
D	6	16	0	22	90	50	0	140
OPERATORS	405	1,258	187	1,850	9,785	10,728	6,765	27,278
A	0	14	6	20	0	0	480	480
B	10	467	93	570	800	5,110	4,965	10,875
C	204	688	88	980	6,120	5,073	1,320	12,513
D	191	89	0	280	2,865	545	0	3,410
LAB TECHNICIANS	34	172	23	229	895	1,403	1,010	3,308
A	0	14	2	16	0	0	160	160
B	2	91	14	107	160	960	745	1,865
C	17	47	7	71	510	333	105	948
D	15	20	0	35	225	110	0	335
MAINTENANCE	64	269	23	356	1,460	2,038	725	4,223
A	0	6	0	6	0	0	0	0
B	1	72	10	83	80	760	530	1,370
C	29	150	13	192	870	1,053	195	2,118
D	34	41	0	75	510	225	0	735

TAB A

EXHIBIT 3 - CHARACTERISTICS OF TEXAS MUNICIPAL WASTEWATER TREATMENT PLANT CERTIFIED PERSONNEL

CHARACTERISTICS OF
TEXAS MUNICIPAL WASTEWATER TREATMENT PLANT CERTIFIED PERSONNEL*
(FOR ALL FLOW SIZES - JANUARY, 1976)

Age Analysis

	Number	Percent
Under 21	58	2
21-25	356	12
26-30	437	15
31-35	338	11
36-40	317	10
41-45	301	10
46-50	280	9
51-55	307	10
Over 55	632	21
Unknown	7	
Total	3,033**	

Education Analysis

	Number	Percent
Grammar School	261	9
Two Years High School	300	10
High School	1182	39
High School GED Equivalent	593	19
One Year College	197	6
Two Years College	282	9
BS	187	6
MS or PhD	31	1
Unknown	19	1
Total	3,052**	

TEXAS MUNICIPAL WASTEWATER TREATMENT PLANT CERTIFIED PERSONNEL*
(FOR PLANTS WITH AVERAGE FLOWS OF <1MGD - JANUARY, 1976)

Age Analysis

	Number	Percent
Under 21	32	3
21-25	144	12
26-30	126	10
31-35	136	11
36-40	123	10
41-45	119	10
46-50	117	9
51-55	141	11
Over 55	292	24
Unknown	2	
Total	1,232**	

Education Analysis

	Number	Percent
Grammar School	124	10
Two Years High School	141	11
High School	543	44
High School GED Equivalent	208	16
One Year College	74	6
Two Years College	87	7
BS	47	4
MS or PhD	8	1
Unknown	8	1
Total	1,240**	

TEXAS MUNICIPAL WASTEWATER TREATMENT PLANT CERTIFIED PERSONNEL*
(FOR PLANTS WITH AVERAGE FLOWS OF ≥1MGD - JANUARY, 1976)

Age Analysis

	Number	Percent
Under 21	26	2
21-25	212	12
26-30	311	17
31-35	202	11
36-40	194	11
41-45	182	10
46-50	163	9
51-55	166	9
Over 55	340	19
Unknown	5	
Total	1,801**	

Education Analysis

	Number	Percent
Grammar School	137	7
Two Years High School	159	9
High School	639	35
High School GED Equivalent	385	21
One Year College	123	7
Two Years College	195	11
BS	140	8
MS or PhD	23	1
Unknown	11	1
Total	1,812**	

*These analyses pertain to the current employment figures for the municipal system category as displayed in the accompanying computer printouts. These analyses do not include the distribution into the municipal system category of workers with an unknown system category. The current employment figures on the informational output charts do include the distribution of workers with an unknown system category.

**These analyses include all personnel categories as displayed on the accompanying computer printouts (the four major occupations, unknown wastewater grade, unknown wastewater position, collection system serviceman, retired, unemployed, and not employed in wastewater). (See Tab A, Exhibits 3-1 and 3-2). In future months, separate analyses will be completed for the four major occupations. The sum of the <1MGD and ≥1MGD flow groups for the age analysis (1232 + 1801 = 3033) is somewhat less than the actual number currently employed in the two flow groups (1240 + 1812 = 3052) due to the absence of birth dates on some of the entries in the certification file.

TAB A, EXHIBIT 3-1

RM TJ0008 *** TEXAS WATER QUALITY BOARD *** PAGE 001
STEWATER SYSTEM WASTEWATER WORKFORCE OCCUPATION FLOW = 0

MUNICIPAL

SITION CODE	NUMBER CERTIFIED - DISTRICT 01						NUMBER CERTIFIED - DISTRICT 02						NUMBER CERTIFIED - DISTRICT 03					
	TOTAL	1	2	3	4	UNKN	TOTAL	1	2	3	4	UNKN	TOTAL	1	2	3	4	UNKN
30	19	1	10	7	0	1	17	0	12	3	2	0	16	3	9	3	0	1
60	5	1	3	1	0	0	3	1	2	0	0	0	4	1	2	1	0	0
34	26	4	16	6	0	0	31	6	23	1	0	1	30	1	22	4	1	2
62	1	1	0	0	0	0	3	0	0	2	1	0	3	1	2	0	0	0
35	1	0	1	0	0	0	1	0	1	0	0	0	1	0	0	0	1	0
63	5	4	1	0	0	0	21	2	13	6	0	0	16	8	3	5	0	0
36	9	4	2	2	0	1	12	3	6	1	0	2	20	6	13	0	0	1
64	1	0	1	0	0	0	6	0	4	2	0	0	4	2	1	1	0	0
39	2	0	0	2	0	0	2	0	0	2	0	0	1	0	0	0	0	1
65	0	0	0	0	0	0	6	1	3	2	0	0	1	0	1	0	0	0
41	5	0	2	1	0	2	12	1	5	2	0	4	12	2	6	3	0	1
31	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	1	0	1
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33	1	0	1	0	0	0	2	0	1	1	0	0	1	1	0	0	0	0
66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
57	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
69	1	0	1	0	0	0	2	1	1	0	0	0	1	1	0	0	0	0
38	11	2	2	2	0	5	4	0	1	0	0	3	4	1	1	0	0	2
70	1	0	1	0	0	0	0	0	0	0	0	0	3	1	2	0	0	0
40	4	0	3	1	0	0	6	0	2	3	0	1	12	1	6	3	0	2
97	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
98	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
99	1	0	1	0	0	0	1	0	1	0	0	0	3	0	1	2	0	0
UNKN POSITION	20	5	13	2	0	0	17	2	9	2	1	3	25	4	12	5	0	4
TOTAL	113	22	58	24	0	9	146	17	84	27	4	14	159	33	81	28	2	15
SUPERVISORS	57	7	34	15	0	1	61	7	40	9	3	2	69	8	43	11	2	5
OPERATORS	17	8	4	4	0	1	41	5	23	11	0	2	41	16	17	6	0	2
LAB WORKERS	1	0	1	0	0	0	2	0	1	1	0	0	3	1	0	1	0	1
MAINTAINS	12	2	3	2	0	5	6	1	2	0	0	3	5	2	1	0	0	2

FORM TJ0006 *** TEXAS WATER QUALITY BOARD *** PAGE 002
WASTEWATER SYSTEM WASTEWATER WORKFORCE OCCUPATION FLOW = 0

POSITION CODE	NUMBER CERTIFIED - DISTRICT 04 TOTAL	1	2	3	4	UNKN	NUMBER CERTIFIED - DISTRICT 05 TOTAL	1	2	3	4	UNKN	NUMBER CERTIFIED - DISTRICT 06 TOTAL	1	2	3	4	UNKN
30	27	3	13	6	1	4	11	0	8	1	0	2	7	0	5	1	1	0
60	5	1	3	1	0	0	4	1	0	2	0	1	2	2	0	0	0	0
34	43	8	23	9	0	3	34	2	23	9	0	0	14	4	7	2	0	1
62	1	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0
35	5	2	2	0	0	1	1	0	0	0	1	0	1	0	0	1	0	0
63	26	7	13	6	0	0	9	2	6	1	0	0	9	4	4	1	0	0
36	21	4	8	5	2	2	11	2	5	3	0	1	21	7	8	3	0	3
64	1	0	0	1	0	0	3	2	1	0	0	0	1	0	1	0	0	0
39	7	1	5	0	0	1	2	1	1	0	0	0	1	0	0	0	0	1
65	4	1	2	0	1	0	2	2	0	0	0	0	0	0	0	0	0	0
41	18	0	9	4	3	2	5	1	2	2	0	0	1	1	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0
66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
69	2	1	1	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
38	25	3	18	1	0	7	4	1	2	0	0	1	4	1	2	0	0	1
70	0	0	0	0	0	0	1	1	0	0	0	0	1	0	1	0	0	0
40	11	0	6	3	0	2	16	3	6	1	0	6	2	0	1	1	0	0
97	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
98	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
99	3	0	1	1	0	1	3	1	2	0	0	0	0	0	0	0	0	0
UNKN POSITION	54	9	30	7	0	8	17	4	10	3	0	0	14	1	8	3	0	2
TOTAL	258	40	134	46	7	31	124	24	66	22	1	11	80	21	38	12	1	8
SUPERVISORS	92	14	47	20	1	10	68	8	37	13	1	9	27	6	14	5	1	1
OPERATORS	55	12	26	12	2	3	25	7	13	4	0	1	32	11	13	4	0	4
LAB WORKERS	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0
MAINTAINS	31	4	19	1	0	7	4	[illegible]	2	0	0	1	5	2	2	0	0	1

FORM TJ0008 *** TEXAS WATER QUALITY BOARD *** PAGE 003
WASTEWATER SYSTEM WASTEWATER WORKFORCE OCCUPATION FLOW = 0

POSITION CODE	NUMBER CERTIFIED - DISTRICT 07						NUMBER CERTIFIED - DISTRICT 08						NUMBER CERIFIED - DISTRICT 09					
	TOTAL	1	2	3	4	UNKN	TOTAL	1	2	3	4	UNKN	TOTAL	1	2	3	4	UNKN
30	12	0	7	4	1	0	17	0	9	6	0	2	3	0	2	0	0	1
60	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	16	2	12	2	0	0	23	3	11	8	0	1	10	1	9	0	0	0
62	1	0	0	1	0	0	1	0	1	0	0	0	0	0	0	0	0	0
35	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
63	10	2	8	0	0	0	6	1	5	0	0	0	3	1	2	0	0	0
36	12	2	10	0	0	0	6	0	4	1	0	1	3	1	2	0	0	0
64	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39	4	0	2	0	0	2	1	0	1	0	0	0	0	0	0	0	0	0
65	2	0	2	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0
41	0	0	0	0	0	0	5	0	3	1	0	1	4	1	2	0	0	1
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0
66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
69	0	0	0	0	0	0	4	4	0	0	0	0	0	0	0	0	0	0
38	5	0	4	0	0	1	4	1	3	0	0	0	2	1	1	0	0	0
70	1	0	1	0	0	0	1	0	1	0	0	0	1	1	0	0	0	0
40	6	1	4	1	0	0	10	1	6	2	0	1	4	1	2	0	0	1
97	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
98	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
99	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
UNKN POSITION	9	2	6	0	0	1	10	4	4	1	0	1	7	0	5	1	0	1
TOTAL	82	10	59	8	1	4	89	14	49	19	0	7	38	7	25	2	0	4
SUPERVISORS	38	4	25	8	1	0	52	4	28	16	0	4	18	3	13	0	0	2
OPERATORS	27	4	21	0	0	2	13	1	10	1	0	1	6	2	4	0	0	0
LAB WORKERS	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0
MAINTAINS	5	0	4	0	0	1	8	5	3	0	0	0	2	1	1	0	0	0

POSITION CODE	NUMBER CERTIFIED - DISTRICT 10						NUMBER CERTIFIED - DISTRICT 11						NUMBER CERIFIED - DISTRICT 12					
	TOTAL	1	2	3	4	UNKN	TOTAL	1	2	3	4	UNKN	TOTAL	1	2	3	4	UNKN
30	9	2	3	2	1	1	7	0	5	2	0	0	12	1	9	1	0	1
60	1	0	0	1	0	0	1	0	1	0	0	0	1	0	0	1	0	0
34	6	1	3	2	0	0	4	0	1	3	0	0	4	0	2	2	0	0
62	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
63	4	2	2	0	0	0	4	1	3	0	0	0	9	3	6	0	0	0
36	6	0	4	2	0	0	5	0	2	0	0	3	9	2	2	4	0	1
64	0	0	0	0	0	0	1	0	1	0	0	0	1	1	0	0	0	0
39	0	0	0	0	0	0	1	1	0	0	0	0	1	1	0	0	0	0
65	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0
41	3	0	0	1	0	2	4	0	3	1	0	0	5	1	2	2	0	0
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
69	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	0	0	0
38	5	1	2	0	0	2	2	0	1	1	0	0	5	2	2	1	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	3	0	1	1	0	1	6	2	3	1	0	0
97	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
98	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
UNKN POSITION	5	1	1	2	0	1	7	1	5	0	0	1	14	5	6	1	0	2
TOTAL	40	8	15	10	1	6	41	5	23	8	0	5	70	19	33	14	0	4
SUPERVISORS	16	3	6	5	1	1	17	2	8	6	0	1	23	3	14	5	0	1
OPERATORS	10	2	6	2	0	0	11	2	6	0	0	3	20	7	8	4	0	1
LAB WORKERS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MAINTAINS	5	1	2	0	0	2	2	0	1	1	0	0	7	3	3	1	0	0

FORM TJ0008 *** TEXAS WATER QUALITY BOARD *** PAGE 005
WASTEWATER SYSTEM WASTEWATER WORKFORCE OCCUPATION FLOW = 0

POSITION CODE	NUMBER CERTIFIED - UNKN DIST TOTAL	1	2	3	4	UNKN	NUMBER CERTIFIED - STATE OF TX TOTAL	1	2	3	4	UNKN
30	0	0	0	0	0	0	157	10	42	36	6	13
60	0	0	0	0	0	0	27	8	11	7	0	1
34	0	0	0	0	0	0	241	32	152	48	1	8
62	0	0	0	0	0	0	13	5	3	4	1	0
35	0	0	0	0	0	0	11	2	5	1	2	1
63	0	0	0	0	0	0	122	37	66	19	0	0
36	0	0	0	0	0	0	135	31	66	21	2	15
64	0	0	0	0	0	0	19	5	10	4	0	0
39	0	0	0	0	0	0	22	4	9	4	0	5
65	0	0	0	0	0	0	18	5	9	3	1	0
41	0	0	0	0	0	0	74	7	34	17	3	13
31	0	0	0	0	0	0	2	0	0	1	0	1
32	0	0	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	6	1	3	2	0	0
66	0	0	0	0	0	0	0	0	0	0	0	0
67	0	0	0	0	0	0	0	0	0	0	0	0
68	0	0	0	0	0	0	0	0	0	0	0	0
69	0	0	0	0	0	0	13	9	4	0	0	0
38	0	0	0	0	0	0	79	13	39	5	0	22
70	0	0	0	0	0	0	9	3	6	0	0	0
40	0	0	0	0	0	0	80	9	40	17	0	14
97	0	0	0	0	0	0	0	0	0	0	0	0
98	0	0	0	0	0	0	1	0	0	1	0	0
99	0	0	0	0	0	0	12	1	7	3	0	1
UNKN POSITION	0	0	0	0	0	0	199	38	109	27	1	24
TOTAL	0	0	0	0	0	0	1240	220	665	220	17	118
SUPERVISORS	0	0	0	0	0	0	538	69	309	113	10	37
OPERATORS	0	0	0	0	0	0	298	77	151	48	2	20
LAB WORKERS	0	0	0	0	0	0	8	1	3	3	0	1
MAINTAINS	0	0	0	0	0	0	92	22	43	5	0	22

FORM TJ0008
WASTEWATER SYSTEM

*** TEXAS WATER QUALITY BOARD ***
WASTEWATER WORKFORCE OCCUPATION

PAGE 001
FLOW = 1

POSITION CODE	NUMBER CERTIFIED - DISTRICT 01						NUMBER CERTIFIED - DISTRICT 02						NUMBER CERTIFIED - DISTRICT 03					
	TOTAL	1	2	3	4	UNKN	TOTAL	1	2	3	4	UNKN	TOTAL	1	2	3	4	UNKN
30	3	0	0	2	0	1	1	0	0	1	0	0	5	0	4	1	0	0
60	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0
34	9	0	2	1	4	2	2	0	0	1	0	1	10	1	3	5	0	1
62	2	0	0	0	2	0	1	0	0	0	1	0	4	1	1	1	1	0
35	1	0	0	1	0	0	1	0	0	1	0	0	2	0	0	2	0	0
63	25	6	11	8	0	0	8	0	3	5	0	0	56	10	28	18	0	0
36	5	0	2	2	0	1	3	0	3	0	0	0	6	0	1	2	1	2
64	3	0	1	2	0	0	0	0	0	0	0	0	5	2	2	1	0	0
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
65	3	1	1	1	0	0	1	0	1	0	0	0	10	2	6	1	0	1
41	4	0	1	2	0	1	4	0	1	2	1	0	8	0	6	1	0	1
31	1	0	0	1	0	0	0	0	0	0	0	0	4	1	1	2	0	0
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33	1	0	1	0	0	0	2	0	1	1	0	0	8	2	1	5	0	0
66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
67	0	0	0	0	0	0	1	0	1	0	0	0	3	0	0	3	0	0
68	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
69	2	0	2	0	0	0	4	1	3	0	0	0	20	9	8	2	0	1
38	2	0	1	1	0	0	4	0	2	2	0	0	7	2	3	0	0	2
70	1	0	0	1	0	0	1	0	0	1	0	0	1	0	1	0	0	0
40	3	0	2	0	0	1	0	0	0	0	0	0	4	1	2	1	0	0
97	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
98	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0
99	1	0	1	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0
UNKN POSITION	12	0	4	4	2	2	14	1	4	8	0	1	20	1	9	5	1	3
TOTAL	80	7	30	27	8	8	48	2	20	22	2	2	175	32	77	51	4	11
SUPERVISORS	20	0	5	5	6	4	6	0	0	4	1	1	27	3	11	10	2	1
OPERATORS	34	6	14	13	0	1	11	0	6	5	0	0	67	12	31	21	1	2
LAB WORKERS	2	0	1	1	0	0	3	0	2	1	0	0	15	3	2	10	0	0
MAINTAINS	4	0	3	1	0	0	8	[illegible]	5	2	0	0	27	11	11	2	0	3

ORM TJ0008 *** TEXAS WATER QUALITY BOARD *** PAGE 005
ASTEWATER SYSTEM WASTEWATER WORKFORCE OCCUPATION FLOW = 1

OSITION CODE	NUMBER CERTIFIED - UNKN DIST						NUMBER CERTIFIED - STATE OF TX						NUMBER CERIFIED - TX-ALL FLOW					
	TOTAL	1	2	3	4	UNKN	TOTAL	1	2	3	4	UNKN	TOTAL	1	2	3	4	UNKN
30	0	0	0	0	0	0	87	3	37	30	8	9	244	13	129	66	14	22
60	0	0	0	0	0	0	27	0	8	12	7	0	54	8	19	19	7	1
34	0	0	0	0	0	0	70	2	33	22	8	5	311	34	185	70	9	13
62	0	0	0	0	0	0	50	1	10	24	15	0	63	6	13	28	16	0
35	0	0	0	0	0	0	17	0	2	9	6	0	28	2	7	10	8	1
63	0	0	0	0	0	0	579	86	302	185	4	2	701	123	368	204	4	2
36	0	0	0	0	0	0	98	9	41	37	2	9	233	40	107	58	4	24
64	0	0	0	0	0	0	39	5	24	10	0	0	58	10	34	14	0	0
39	0	0	0	0	0	0	33	3	13	6	4	7	55	7	22	10	4	12
65	0	0	0	0	0	0	72	12	45	10	3	2	90	17	54	13	4	2
41	0	0	0	0	0	0	138	6	63	34	7	28	212	13	97	51	10	41
31	0	0	0	0	0	0	25	1	2	15	4	3	27	1	2	16	4	4
32	0	0	0	0	0	0	3	0	2	1	0	0	3	0	2	1	0	0
33	0	0	0	0	0	0	48	7	18	21	1	1	54	8	21	23	1	1
66	0	0	0	0	0	0	2	0	0	2	0	0	2	0	0	2	0	0
67	0	0	0	0	0	0	5	0	2	3	0	0	5	0	2	3	0	0
68	0	0	0	0	0	0	5	0	3	2	0	0	5	0	3	2	0	0
69	0	0	0	0	0	0	72	19	41	10	0	2	85	28	45	10	0	2
38	0	0	0	0	0	0	82	8	30	24	2	18	161	21	69	29	2	40
70	0	0	0	0	0	0	14	0	3	9	2	0	23	3	9	9	2	0
40	0	0	0	0	0	0	54	2	27	16	2	7	134	11	67	33	2	21
97	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0	0	0
98	0	0	0	0	0	0	1	0	1	0	0	0	2	0	1	1	0	0
99	0	0	0	0	0	0	29	5	13	9	2	0	41	6	20	12	2	1
UNKN POSITION	0	0	0	0	0	0	261	21	130	74	7	29	460	59	239	101	8	53
TOTAL	0	0	0	0	0	0	1812	190	851	565	84	122	3052	410	1516	785	101	240
SUPERVISORS	0	0	0	0	0	0	319	8	120	122	48	21	857	77	429	235	58	58
OPERATORS	0	0	0	0	0	0	754	103	383	240	10	18	1052	180	534	288	12	38
LAB WORKERS	0	0	0	0	0	0	81	8	24	40	5	4	89	9	27	43	5	5
MAINTAINS	0	0	0	0	0	0	156	27	71	36	2	20	248	49	114	41	2	42

TAB A, EXHIBIT 3-2

FORM TJ0018

*** TEXAS WATER QUALITY BOARD ***

PAGE 001

FLOW = 0

WORKFORCE EDUCATION BACKGROUND
WASTEWATER SYSTEM
DISTRICT 01

MUNICIPAL

EMPLOYEE AGE	CODE 01	CODE 02	CODE 03	CODE 04	CODE 05	CODE 06	CODE 07	CODE 08	CODE 09	UNKN CODE
UNDER 21	0000	0000	0003	0000	0001	0000	0000	0000	0000	0000
21 - 25	0000	0000	0006	0001	0001	0001	0000	0000	0000	0000
26 - 30	0000	0001	0004	0001	0001	0000	0001	0000	0000	0000
31 - 35	0000	0004	0006	0002	0000	0000	0001	0000	0000	0001
36 - 40	0000	0002	0003	0003	0001	0000	0001	0000	0000	0000
41 - 45	0000	0001	0005	0003	0000	0002	0001	0000	0000	0000
46 - 50	0002	0000	0005	0002	0000	0000	0000	0000	0000	0001
51 - 55	0003	0004	0008	0002	0000	0000	0000	0001	0000	0000
OVER 55	0006	0006	0012	0001	0000	0001	0002	0000	0000	0000
UNKN AGE	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000

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FORM TJ0018 *** TEXAS WATER QUALITY BOARD *** PAGE 002

FLOW = 0

WORKFORCE EDUCATION BACKGROUND
WASTEWATER SYSTEM
DISTRICT 02

EMPLOYEE AGE	CODE 01	CODE 02	CODE 03	CODE 04	CODE 05	CODE 06	CODE 07	CODE 08	CODE 09	UNKN CODE
UNDER 21	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
21 - 25	0000	0001	0006	0001	0001	0000	0000	0000	0000	0000
26 - 30	0000	0000	0004	0002	0000	0001	0000	0000	0000	0000
31 - 35	0000	0000	0004	0001	0001	0000	0000	0000	0000	0000
36 - 40	0001	0007	0006	0002	0000	0001	0001	0000	0000	0000
41 - 45	0002	0001	0012	0004	0001	0002	0000	0000	0000	0000
46 - 50	0001	0002	0009	0004	0002	0003	0000	0000	0000	0000
51 - 55	0003	0000	0007	0004	0001	0001	0001	0001	0000	0000
OVER 55	0013	0009	0015	0003	0001	0003	0001	0000	0000	0000
UNKN AGE	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000

FORM TJ0018 *** TEXAS WATER QUALITY BOARD *** PAGE 014

FLOW = 0

WORKFORCE EDUCATION BACKGROUND
WASTEWATER SYSTEM
STATE OF TX

EMPLOYEE AGE	CODE 01	CODE 02	CODE 03	CODE 04	CODE 05	CODE 06	CODE 07	CODE 08	CODE 09	UNKN CODE
UNDER 21	0001	0005	0020	0003	0002	0001	0000	0000	0000	0000
21 - 25	0034	0010	0078	0021	0018	0010	0003	0000	0000	0001
26 - 30	0002	0005	0066	0027	0011	0010	0004	0001	0000	0000
31 - 35	0034	0010	0051	0041	0009	0010	0010	0001	0000	0001
36 - 40	0010	0018	0052	0024	0010	0002	0005	0002	0000	0001
41 - 45	0017	0013	0044	0023	0006	0010	0006	0000	0000	0001
46 - 50	0037	0015	0055	0028	0004	0005	0003	0000	0000	0001
51 - 55	0022	0015	0057	0023	0004	0013	0005	0002	0000	0001
OVER 55	0057	0049	0120	0018	0010	0025	0011	0002	0000	0001
UNKN AGE	0000	0001	0030	0000	0000	0001	0000	0000	0000	0001

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FORM TJ0018 *** TEXAS WATER QUALITY BOARD *** PAGE 001

FLOW = 1

WORKFORCE EDUCATION BACKGROUND
WASTEWATER SYSTEM
DISTRICT 01

EMPLOYEE AGE	CODE 01	CODE 02	CODE 03	CODE 04	CODE 05	CODE 06	CODE 07	CODE 08	CODE 09	UNKN CODE
UNDER 21	0000	0000	0001	0000	0000	0000	0000	0000	0000	0000
21 - 25	0000	0000	0010	0000	0000	0002	0000	0000	0000	0000
26 - 30	0000	0000	0006	0002	0000	0003	0001	0000	0000	0000
31 - 35	0000	0001	0001	0002	0000	0000	0000	0000	0000	0000
36 - 40	0000	0001	0002	0005	0001	0002	0001	0000	0000	0000
41 - 45	0000	0001	0003	0003	0001	0002	0000	0000	0000	0000
46 - 50	0000	0001	0004	0003	0000	0000	0002	0000	0000	0000
51 - 55	0001	0001	0000	0002	0000	0000	0000	0000	0000	0000
OVER 55	0003	0002	0002	0006	0000	0001	0000	0001	0000	0000
UNKN AGE	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000

FLOW = 1

WORKFORCE EDUCATION BACKGROUND
WASTEWATER SYSTEM
DISTRICT 02

EMPLOYEE AGE	CODE 01	CODE 02	CODE 03	CODE 04	CODE 05	CODE 06	CODE 07	CODE 08	CODE 09	UNKN CODE
UNDER 21	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
21 - 25	0000	0000	0000	0000	0002	0000	0000	0000	0000	0000
26 - 30	0000	0000	0003	0001	0003	0000	0003	0000	0000	0000
31 - 35	0000	0000	0002	0001	0000	0001	0001	0000	0000	0000
36 - 40	0001	0002	0000	0000	0001	0000	0000	0000	0000	0000
41 - 45	0001	0000	0000	0000	0000	0000	0001	0000	0000	0000
46 - 50	0002	0000	0000	0000	0001	0000	0000	0000	0000	0000
51 - 55	0000	0002	0002	0001	0000	0002	0001	0000	0000	0001
OVER 55	0001	0001	0008	0000	0001	0000	0001	0000	0000	0000
UNKN AGE	0000	0000	0000	0000	0000	0000	0000	0000	0000	0001

FORM TJ0018 *** TEXAS WATER QUALITY BOARD *** PAGE 014

WORKFORCE EDUCATION BACKGROUND
WASTEWATER SYSTEM
STATE OF TX

FLOW = 1

EMPLOYEE AGE	CODE 01	CODE 02	CODE 03	CODE 04	CODE 05	CODE 06	CODE 07	CODE 08	CODE 09	UNKN CODE
UNDER 21	0001	0002	0021	0002	0000	0000	0000	0000	0000	0000
21 - 25	0000	0005	0109	0032	0027	0029	0006	0000	0000	0000
26 - 30	0001	0008	0121	0066	0031	0046	0034	0004	0000	0001
31 - 35	0007	0013	0079	0047	0013	0023	0016	0004	0000	0000
36 - 40	0007	0016	0053	0060	0021	0023	0013	0001	0000	0000
41 - 45	0012	0015	0050	0057	0006	0024	0015	0003	0000	0001
46 - 50	0019	0011	0050	0041	0006	0015	0019	0002	0000	0002
51 - 55	0020	0023	0048	0041	0003	0015	0013	0003	0000	0002
OVER 55	0070	0062	0106	0038	0015	0020	0024	0005	0000	0003
UNKN AGE	0000	0000	0002	0001	0001	0000	0000	0001	0000	0002

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FORM TJ0018 *** TEXAS WATER QUALITY BOARD *** PAGE 015

WORKFORCE EDUCATION BACKGROUND
WASTEWATER SYSTEM
TX-ALL FLOW

EMPLOYEE AGE	CODE 01	CODE 02	CODE 03	CODE 04	CODE 05	CODE 06	CODE 07	CODE 08	CODE 09	UNKN CODE
UNDER 21	0002	0007	0041	0005	0002	0001	0000	0000	0000	0000
21 - 25	0004	0019	0187	0053	0045	0039	0009	0000	0000	0001
26 - 30	0003	0013	0197	0093	0042	0056	0038	0005	0000	0001
31 - 35	0011	0023	0130	0088	0022	0033	0026	0005	0000	0001
36 - 40	0017	0034	0105	0084	0031	0025	0018	0003	0000	0001
41 - 45	0029	0028	0194	0080	0012	0034	0021	0003	0000	0002
46 - 50	0026	0028	0135	0069	0013	0020	0022	0002	0000	0003
51 - 55	0042	0038	0105	0064	0007	0028	0018	0005	0000	0003
OVER 55	0127	0111	0226	0055	0025	0045	0035	0007	0000	0004
UNKN AGE	0000	0001	0032	0001	0001	0001	0000	0001	0000	0003

TAB A, EXHIBIT 3-3

FORM TJ000R *** TEXAS WATER QUALITY BOARD *** PAGE 001

WASTEWATER WORKFORCE BACKGROUND
WASTEWATER SYSTEM
DISTRICT 01

MUNICIPAL

FLOW = 0

EMPLOYEE AGE	YEARS OF EDUCATION TOTAL	-- AVERAGE	HOURS OF TRAINING TOTAL	-- AVERAGE	YEARS OF EXPERIENCE TOTAL	-- AVERAGE	YEARS AT ONE SYSTEM TOTAL	-- AVERAGE	YEARS AT PRES DUTY TOTAL	-- AVERAGE
UNDER 21	0004	003	0004	035	0004	001	0003	001	0003	001
21 - 25	0009	003	0009	060	0008	002	0005	001	0005	001
26 - 30	0008	003	0008	090	0007	003	0005	001	0004	001
31 - 35	0013	00[illegible]	0013	081	0012	005	0011	003	0008	003
36 - 40	0010	003	0010	126	0010	005	0008	003	0009	003
41 - 45	0012	004	0012	143	0012	009	0008	007	0011	005
46 - 50	0009	002	0010	117	0010	006	0008	004	0007	004
51 - 55	0018	002	0018	143	0018	012	0017	011	0014	011
OVER 55	0028	002	0028	104	0027	015	0027	012	0026	011
UNKN AGE	0000	000	0000	000	0000	000	0000	000	0000	000

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FORM TJ0008                 * * *  T E X A S   W A T E R   Q U A L I T Y   B O A R D  * * *                 PAGE 002
                                        WASTEWATER WORKFORCE BACKGROUND                                 FLOW = 0
                                              WASTEWATER SYSTEM
                                                 DISTRICT 02

               ------------------   ------------------   ------------------   ------------------   ------------------
EMPLOYEE       YEARS OF EDUCATION   HOURS OF TRAINING    YEARS OF EXPERIENCE  YEARS AT ONE SYSTEM  YEARS AT PRES DUTY
AGE            TOTAL -- AVERAGE     TOTAL -- AVERAGE     TOTAL -- AVERAGE     TOTAL -- AVERAGE     TOTAL -- AVERAGE
               ------------------   ------------------   ------------------   ------------------   ------------------

   UNDER 21      0000      000        0000      000        0000      000        0000      000        0000      000

   21 - 25       0009      003        0009      044        0006      002        0005      001        0005      001

   26 - 30       0007      003        0007      071        0007      004        0007      002        0007      002

   31 - 35       0006      003        0006      112        0006      005        0005      003        0005      003

   36 - 40       0018      003        0017      117        0018      010        0017      007        0017      007

   41 - 45       0022      003        0022      118        0022      008        0019      006        0017      005

   46 - 50       0021      003        0020      109        0020      008        0015      008        0016      005

   51 - 55       0018      003        0018      096        0017      007        0017      005        0015      005

   OVER 55       0045      002        0044      096        0045      016        0043      014        0043      012

   UNKN AGE      0000      000        0000      000        0000      000        0000      000        0000      000
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FORM TJ0008            *** T E X A S   W A T E R   Q U A L I T Y   B O A R D ***                    PAGE 014
                                    WASTEWATER WORKFORCE BACKGROUND                                 FLOW = 0
                                          WASTEWATER SYSTEM
                                            STATE OF TX

               ------------------   -----------------   -------------------   -------------------   -------------------
EMPLOYEE       YEARS OF EDUCATION   HOURS OF TRAINING   YEARS OF EXPERIENCE   YEARS AT ONE SYSTEM   YEARS AT PRES DUTY
AGE             TOTAL -- AVERAGE     TOTAL -- AVERAGE     TOTAL -- AVERAGE      TOTAL -- AVERAGE     TOTAL -- AVERAGE
               ------------------   -----------------   -------------------   -------------------   -------------------

  UNDER 21        0032     003        0031     064         0029     002          0018     001          0043     002

  21 - 25         0144     003        0141     080         0134     002          0092     001          0296     003

  26 - 30         0126     003        0125     098         0122     003          0094     002          0404     003

  31 - 35         0136     003        0134     098         0135     005          0100     003          0297     003

  36 - 40         0123     003        0120     104         0120     006          0103     004          0297     004

  41 - 45         0119     003        0119     113         0119     008          0096     006          0274     004

  46 - 50         0117     003        0115     109         0117     008          0096     006          0257     004

  51 - 55         0141     003        0139     113         0139     010          0125     008          0286     005

  OVER 55         0292     003        0282     096         0289     015          0267     012          0605     006

  UNKN AGE        0002     004        0003     093         0003     002          0002     002          0007     003
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FORM TJ0008 *** TEXAS WATER QUALITY BOARD *** PAGE 001

WASTEWATER WORKFORCE BACKGROUND
WASTEWATER SYSTEM
DISTRICT 01

FLOW = 1

EMPLOYEE AGE	YEARS OF EDUCATION TOTAL	YEARS OF EDUCATION AVERAGE	HOURS OF TRAINING TOTAL	HOURS OF TRAINING AVERAGE	YEARS OF EXPERIENCE TOTAL	YEARS OF EXPERIENCE AVERAGE	YEARS AT ONE SYSTEM TOTAL	YEARS AT ONE SYSTEM AVERAGE	YEARS AT PRES DUTY TOTAL	YEARS AT PRES DUTY AVERAGE
UNDER 21	0001	003	0001	026	0000	000	0000	000	0000	000
21 - 25	0012	003	0012	093	0012	002	0009	001	0008	001
26 - 30	0012	004	0012	105	0012	004	0011	002	0011	001
31 - 35	0004	003	0004	162	0004	008	0004	006	0003	007
36 - 40	0012	004	0011	169	0012	006	0012	004	0010	005
41 - 45	0010	004	0010	143	0010	008	0008	006	0007	007
46 - 50	0010	004	0010	131	0009	015	0010	013	0008	011
51 - 55	0004	002	0004	115	0004	013	0003	013	0003	010
OVER 55	0015	003	0015	117	0015	015	0013	011	0014	010
UNKN AGE	0000	000	0000	000	0000	000	0000	000	0000	000

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FORM TJ0008 *** TEXAS WATER QUALITY BOARD *** PAGE 002

WASTEWATER WORKFORCE BACKGROUND
WASTEWATER SYSTEM
DISTRICT 02

FLOW = 1

EMPLOYEE AGE	YEARS OF EDUCATION TOTAL	AVERAGE	HOURS OF TRAINING TOTAL	AVERAGE	YEARS OF EXPERIENCE TOTAL	AVERAGE	YEARS AT ONE SYSTEM TOTAL	AVERAGE	YEARS AT PRES DUTY TOTAL	AVERAGE
UNDER 21	0000	000	0000	000	0000	000	0000	000	0000	000
21 - 25	0002	005	0002	121	0002	002	0001	001	0000	000
26 - 30	0010	004	0010	107	0010	003	0007	001	0004	001
31 - 35	0005	004	0005	095	0005	004	0004	004	0002	003
36 - 40	0004	002	0004	122	0004	010	0004	006	0004	005
41 - 45	0002	004	0002	007	0002	013	0002	013	0002	010
46 - 50	0003	002	0002	096	0003	014	0003	013	0003	008
51 - 55	0008	004	0009	119	0009	011	0009	008	0009	007
OVER 55	0012	003	0012	095	0012	013	0012	012	0010	008
UNKN AGE	0000	000	0001	040	0001	004	0000	000	0000	000

WASTEWATER WORKFORCE BACKGROUND
WASTEWATER SYSTEM
STATE OF TX

FLOW = 1

EMPLOYEE AGE	YEARS OF EDUCATION TOTAL	YEARS OF EDUCATION AVERAGE	HOURS OF TRAINING TOTAL	HOURS OF TRAINING AVERAGE	YEARS OF EXPERIENCE TOTAL	YEARS OF EXPERIENCE AVERAGE	YEARS AT ONE SYSTEM TOTAL	YEARS AT ONE SYSTEM AVERAGE	YEARS AT PRES DUTY TOTAL	YEARS AT PRES DUTY AVERAGE
UNDER 21	0026	002	0024	048	0023	002	0013	001	0011	001
21 - 25	0212	003	0207	079	0209	002	0149	001	0148	001
26 - 30	0311	004	0306	105	0306	003	0252	002	0237	001
31 - 35	0202	003	0191	118	0198	005	0167	003	0152	003
36 - 40	0194	004	0189	126	0192	008	0172	006	0166	005
41 - 45	0192	003	0178	119	0181	009	0162	007	0143	007
46 - 50	0163	003	0158	117	0162	011	0147	008	0140	007
51 - 55	0166	003	0160	105	0168	012	0147	011	0139	009
OVER 55	0340	003	0320	087	0337	015	0328	014	0292	012
UNKN AGE	0005	004	0007	081	0007	010	0005	011	0005	011

WASTEWATER WORKFORCE BACKGROUND
WASTEWATER SYSTEM
TX-ALL FLOW

EMPLOYEE AGE	YEARS OF EDUCATION TOTAL	YEARS OF EDUCATION AVERAGE	HOURS OF TRAINING TOTAL	HOURS OF TRAINING AVERAGE	YEARS OF EXPERIENCE TOTAL	YEARS OF EXPERIENCE AVERAGE	YEARS AT ONE SYSTEM TOTAL	YEARS AT ONE SYSTEM AVERAGE	YEARS AT PRES DUTY TOTAL	YEARS AT PRES DUTY AVERAGE
UNDER 21	0058	003	0055	057	0052	002	0031	001	0028	001
21 - 25	0356	003	0348	079	0343	002	0241	001	0232	001
26 - 30	0437	004	0431	103	0428	003	0346	002	0330	001
31 - 35	0338	003	0325	110	0333	005	0267	003	0257	003
36 - 40	0317	003	0309	117	0312	007	0275	005	0259	005
41 - 45	0301	003	0297	117	0300	009	0258	007	0235	006
46 - 50	0280	003	0273	114	0279	010	0243	007	0234	007
51 - 55	0307	003	0299	109	0307	011	0272	010	0257	008
OVER 55	0632	003	0602	091	0626	015	0595	013	0557	012
UNKN AGE	0007	004	0010	084	0010	008	0007	008	0007	008

TAB A

EXHIBIT 4 - DATA ON CURRENT EMPLOYMENT STATUS OF CERTIFIED PERSONNEL NOT ENGAGED IN WASTEWATER TREATMENT

(See Tab B, Exhibit 1, for explanation)

TEXAS MUNICIPAL WASTEWATER TREATMENT PLANT CERTIFIED PERSONNEL (For All Flow Sizes)

(Additional Personnel)

	EMPLOYMENT			ACCESSIONS NEEDED				SOURCES OF ACCESSIONS		
					REPLACE LOSSES					
	CURRENT-Jan. '76	RECOMMENDED	PROJECTED	PLANT EXPANSIONS	SEPARATIONS	TRANS OUT	TOTAL	TRANSFERS IN	NEW HIRES	TOTAL
TOTAL	338									
COLLECTION SYSTEM SERVICEMAN	[i] 338									
A	14									
B	80									
C	205									
D	39									
Unknown WW Grade[f]	65									
RETIRED	1									
A	0									
B	0									
C	1									
D	0									
Unknown WW Grade[f]	0									
UNEMPLOYED	2									
A	0									
B	1									
C	1									
D	0									
Unknown WW Grade[f]	0									
NOT EMPLOYED IN WASTEWATER	40									
A	2									
B	12									
C	20									
D	6									
Unknown WW Grade[f]	1									
UNKNOWN POSITION[k]	407									
A	8									
B	101									
C	239									
D	59									
Unknown WW Grade[f]	53									

TEXAS MUNICIPAL WASTEWATER TREATMENT PLANT CERTIFIED PERSONNEL (Average Flows of <1MGD)

(Additional Personnel)

	EMPLOYMENT			ACCESSIONS NEEDED				SOURCES OF ACCESSIONS		
					REPLACE LOSSES					
	CURRENT-Jan. '76	RECOM-MENDED	PROJECTED	PLANT EXPANSIONS	SEPAR-ATIONS	TRANS-OUT	TOTAL	TRANSFERS IN	NEW HIRES	TOTAL
TOTAL	103									
COLLECTION SYSTEM SERVICEMAN	[i] 103									
A	4									
B	25									
C	58									
D	16									
Unknown WW Grade [f]	20									
RETIRED [j]										
A										
B										
C										
D										
Unknown WW Grade										
UNEMPLOYED [j]										
A										
B										
C										
D										
Unknown WW Grade										
NOT EMPLOYED IN WASTEWATER [j]										
A										
B										
C										
D										
Unknown WW Grade										
UNKNOWN POSITION [j]										
A										
B										
C										
D										
Unknown WW Grade										

TEXAS MUNICIPAL WASTEWATER
TREATMENT PLANT CERTIFIED
PERSONNEL (Average Flows of
≥1MGD)
(Additional Personnel)

	EMPLOYMENT			ACCESSIONS NEEDED				SOURCES OF ACCESSIONS		
	CURRENT- Jan. '76	RECOMMENDED	PROJECTED	PLANT EXPANSIONS	REPLACE LOSSES		TOTAL	TRANSFERS IN	NEW HIRES	TOTAL
					SEPARATIONS	TRANS OUT				
TOTAL	235									
COLLECTION SYSTEM SERVICEMAN	[i] 235									
A	10									
B	55									
C	147									
D	23									
Unknown WW Grade [f]	45									
RETIRED [j]										
A										
B										
C										
D										
Unknown WW Grade										
UNEMPLOYED [j]										
A										
B										
C										
D										
Unknown WW Grade										
NOT EMPLOYED IN WASTEWATER [j]										
A										
B										
C										
D										
Unknown WW Grade										
UNKNOWN POSITION [j]										
A										
B										
C										
D										
Unknown WW Grade										

TAB B

EXHIBIT 1 - GUIDE TO INTERPRETING DATA ON INFORMATIONAL OUTPUT CHARTS

GUIDE TO INTERPRETING DATA ON INFORMATIONAL OUTPUT CHARTS

a - This analysis pertains to the municipal certified personnel only. It does not include personnel working at other types of wastewater system categories. (See p. 3 of manpower data base flow charts, TAB B, Exhibit 6).

b - Based upon classifications and individuals in wastewater certification and employment computer file which is maintained and updated by the Texas Department of Health Resources, Division of Environmental Engineering, Certification and Registration Branch. See explanation in the paper in TAB C. Data elements in certification file explained in TAB B, Exhibit 3.

The current employment total as of Jan., 1976, consists of the actual employment plus the distribution of workers with an unknown system category. Workers with an unknown system category were distributed on a percentage basis into each of the four system categories (municipal, other public service organization, industry, and federal entity). The distribution should be fairly accurate as it was calculated on the basis of the number of workers with an unknown system category within each grade of each occupation. (For example, of the 117 Supervisor B personnel with an unknown system category, 108 were distributed into the municipal system category. Separate distributions were completed for each flow group).

c - Not obtained due to time and manpower limitations. Will be derived from the EPA Operation and Maintenance form 7500-5.

d - Based upon analysis of a sample of construction grant projects. See explanation of the methodology used in the paper in TAB C.

Projected employment equals the sum of plant expansions and the current employment. Estimated increases in personnel due to plant expansions were distributed into each grade of each occupation on a percentage basis according to current levels of employment. The data sources used in the construction grant file listed total personnel needed for each project rather than providing specific listings for the number and certification grade of each occupation needed.

e - Explanation and worksheets provided in "Manpower Movement Rates" (TAB B, Exhibit 4) and "Manpower Transition Analysis Guide" and worksheets (TAB B, Exhibits 2 and 2-1).

f - Number of workers with unknown wastewater certificate grades in each occupation not added to current certified employment totals. These are people who have water certificates but are working in wastewater systems.

g - Explanation in "Training Calculations" (TAB B, Exhibit 5).

h - Update and upgrade training totals are not consistent with personnel transfer totals for this occupation due to inter-occupational movement with no change in certification grade. (People in the operator occupation transferring to the same certification grade in the supervisor occupation will be in need of update certification training, not upgrade training.

i - Transition analysis not computed for this occupation due to emphasis on personnel connected with wastewater treatment.

j - For these personnel categories, employment data is not listed separately for the <1MGD and ≥1MGD flow groups due to the fact that such listings would not be meaningful in analyzing actual wastewater employment.

k - Workers with unknown wastewater positions are workers who have wastewater certificates but are working in water systems and thus have water positions.

TAB B

EXHIBIT 2 - MANPOWER TRANSITION ANALYSIS GUIDE

MANPOWER TRANSITION ANALYSIS GUIDE

The manpower transition analysis worksheet provides a means for estimating how manpower movements occur from the beginning to the end of the analysis period. Once completed, this transition analysis projects a career pattern of mobility into, through, and out of the workforce (based upon past experience). The career pattern affords management, either at the state or municipal level, with the opportunity of examining the existing occupational structure. Based upon the data presented in the transition analysis, actions can be taken to alleviate any problem areas (such as employment shortfalls in particular occupations, lack of adequate advancement from lower to higher level positions, or high turnover in particular occupations). The management may wish to develop a definite career ladder by clearly outlining and establishing the ports of entry and promotional opportunities for each job category. Included in the construction of this career ladder should be the outlining of each job category as to specific duties, precise educational qualifications, job-related training requirements, and relationships with other jobs.

The following is a step-by-step account of the procedure used in completing the manpower transition analyses for each of the five years examined in this report. Please refer to the transition analysis for the period January, 1976 - January, 1977 (flow group ≥1MGD) (TAB B, Exhibit 2-1) when specific numbers are mentioned.

(1) Enter the beginning of period employment in column a. This is the current employment as of January, 1976, which is taken directly from the computer printout "Wastewater Workforce Occupation" (TAB A, Exhibit 3-1).

(2) Enter the projected end of period employment in row f. The projected employment is the sum of the current employment and increases in personnel due to plant expansions.

(3) Apply the separation rates listed on the "Manpower Movement Rates" guide (TAB B, Exhibit 4) to the beginning of period employment and enter the number of separations (in whole numbers) in column c. (In instances where rounding was necessary, all numbers .5 or above were rounded to the next higher number). Begin the analysis at the top of the worksheet with the higher level positions and work down completing one certification grade at a time. (Example: separation rate for Supervisor A is .06; .06 (66) = 3.9 = 4 separations.)

(4) Enter the number of personnel remaining in the Supervisor A category (62) in the Supervisor A - Supervisor A block (row A, column A). (Since Supervisor A is at the top of the career pattern, no losses occurred in this job category due to transfers out to other job categories. In the analyses included in this report, all transfers involve upgrading either in terms of certification grade or occupational status).

(5) Subtract the 62 personnel remaining in the Supervisor A block from the number of personnel needed in the Supervisor A category at the end of the period (row f). This subtraction results in the number of accessions or replacements needed. (76-62 = 14 accessions needed).

(6) The accessions needed by Supervisor A will be filled by using the accession rates listed on the "Manpower Movement Rates"

guide (TAB B, Exhibit 4). These accession rates are as follows:
Supervisor B - .40, Operator A - .20, Operator B - .40. Multiply the 14 accessions needed by these rates in order to determine how many transfers will be needed from each of the three categories. (Supervisor B - .40 (14) = 5, Operator A - .20 (14) = 3, Operator B - .40 (14) = 6). As is obvious, rounding is necessary in some instances in order to attain the exact whole number of accessions needed. Next, enter into the appropriate blocks in the Supervisor A column the number of perople transferring in from Supervisor B, Operator A, and Operator B. Add the total number of people transferring into Supervisor A and enter this total in row d. Check to see that the number entered in row d equals the number of accessions needed for the Supervisor A job category. No new hires were used as sources of accessions for Supervisor A due to the high experience and training requirements for this certification grade. Therefore, no number is entered in the Supervisor A block in row e.

(7) Continue the transition analysis down and across the worksheet using the accession rates listed on the "Manpower Movement Rates" guide (TAB B, Exhibit 4). In figuring the number of personnel remaining within each grade of each occupation, be sure to subtract from the beginning of period employment the number of personnel transferring out to another job category (totaled in column b) as well as the number separating. (Example: Supervisor B loses 5 people due to transfers out to Supervisor A and also loses 7 people due to separations: 178 - (5+7) = 166 personnel remaining in the Supervisor B job

category after transfers out and separations. The number remaining is entered in the Supervisor B - Supervisor B block (row B, column B).

(8) After completion of the transition analysis worksheet, transfer the data to the informational output chart for the corresponding time period and flow group. (The data on the "all flow" informational output charts for each of the five years is obtained by simply adding the data on the <1MGD and ≥1MGD informational output charts.) After the transfer of data is complete, proceed with calculating training requirements by using the "Training Calculations" guide (TAB B, Exhibit 5).

(9) Throughout the analysis, remember to use that section of the "Manpower Movement Rates" guide (TAB B, Exhibit 4) and all other guides and worksheets which correspond to the particular flow group (<1MGD or ≥1MGD) that is being analyzed.

(10) The end of period employment for the first year (January, 1976 - January, 1977) is used as the beginning of period employment for the second year (January, 1977 - January, 1978). This procedure of using the end of period employment for one year as the beginning of period employment for the following year is used throughout the five year analysis.

Begin of Period Jan. '76

End of Period Jan. '77

MANPOWER TRANSITION ANALYSIS
(For Plants With Average Flows of < 1MGD)

TAB B, EXHIBIT 2-1

Occupation	Certification Grade	Begin of Period Total	Total Transfers Out	Supervisor					Operator					Lab Technician					Maintenance					Total Separations
				A	B	C	D		A	B	C	D		A	B	C	D		A	B	C	D		
		1271	102																					
S U P V	Total	748	18																					
	A	14		12																				2
	B	165	1	1	151																			13
	C	461	10		10	396																		55
	D	108	7			7	96																	5
O P E R	Total	401	81																					
	A	3	1	1*					2															0
	B	64	3		2*				1	56														5
	C	215	40		5	29*				6	149													26
	D	119	37			7	7*			2	21	76												6
L A B	Total	13																						
	A	0												0										0
	B	5													5									0
	C	5														4								1
	D	3															3							0
M A I N T	Total	109	3																					
	A	0																	0					0
	B	7																		6				1
	C	66	1																	1	57			8
	D	36	2																		2	32		2
Total Transfers In		102		2	17	43	7	Total 69	1	8	21		Total 30					Total		1	2		Total 3	
Total New Hires		143				29	7	36		1	48	45	94			1		1			8	4	12	
End of Period Total		1290		14	168	468	110	760	3	65	218	121	407	0	5	5	3	13	0	7	67	36	110	

*Transfers with no change in certification grade

Begin of Period Jan. '76

End of Period Jan. '77

MANPOWER TRANSITION ANALYSIS
(For Plants With Average Flows of $\geq$ 1MGD)

Occupation	Certification Grade	Begin of Period Total	Total Transfers Out	Supervisor					Operator					Lab Technician					Maintenance					Total Separations
		1805[a]	295[b]	A	B	C	D		A	B	C	D		A	B	C	D		A	B	C	D		c
SUPV	Total	435	23																					
	A	66		62																				4
	B	178	5	5	166																			7
	C	179	12		12	149																		18
	D	12	6			6	4																	2
OPER	Total	1037	231																					
	A	12	3	3*					8															1
	B	318	28	6	16*				6	277														13
	C	549	99		12	23*				64	395													55
	D	158	101			6	5*			18	72	30												27
LAB	Total	131	20																					
	A	9												8										1
	B	61	2											2	57									2
	C	41	9												9	28								4
	D	20	9												3	6	8							3
MAINT	Total	202	21																					
	A	3																	3					0
	B	47	1																1	44				2
	C	109	7																	7	91			11
	D	43	13																	2	11	23		7
Total Transfers In[d]		295		14	40	35	5	Total 94	6	82	72		Total 160	2	12	6		Total 20	1	9	11		Total 21	
Total New Hires[e]		437				23	5	28		9	168	152	329		1	13	15	29		1	24	26	51	
End of Period Total[f]		2085		76	206	207	14	503	14	368	635	182	1199	10	70	47	23	150	4	54	126	49	233	

*Transfers with no change in certification grade

Begin of Period Jan. '77

End of Period Jan. '78

MANPOWER TRANSITION ANALYSIS
(For Plants With Average Flows of <1MGD)

Occupation	Certification Grade	Begin of Period Total	Total Transfers Out	Supervisor					Operator					Lab Technician					Maintenance					Total Separations
		1290	104	A	B	C	D		A	B	C	D		A	B	C	D		A	B	C	D		
SUPV	Total	760	19																					
	A	14		12																				2
	B	168	1	1	154																			13
	C	468	10		10	402																		56
	D	110	8			8	96																	6
OPER	Total	407	82																					
	A	3	1	1*					2															0
	B	65	3		2*				1	57														5
	C	218	40		5	29*				6	152													26
	D	121	38			7	8*			2	21	77												6
LAB	Total	13																						
	A	0												0										0
	B	5													5									0
	C	5														4								1
	D	3															3							0
MAINT	Total	110	3																					
	A	0																	0					0
	B	7																		6				1
	C	67	1																	1	58			8
	D	36	2																		2	32		2
Total Transfers In		104		2	17	44	8	Total 71	1	8	21		Total 30					Total		1	2		Total 3	
Total New Hires		145				29	8	37		1	48	46	95			1		1			8	4	12	
End of Period Total		1309		14	171	475	112	772	3	66	221	123	413	0	5	5	3	13	0	7	68	36	111	

Begin of Period Jan. '77

End of Period Jan. '78

MANPOWER TRANSITION ANALYSIS
(For Plants With Average Flows of
≥ 1MGD)

Occupation	Certification Grade	Begin of Period Total	Total Transfers Out	Supervisor					Operator					Lab Technician					Maintenance					Total Separations
				A	B	C	D		A	B	C	D		A	B	C	D		A	B	C	D		
		2085	306																					
SUPV	Total	503	25																					
	A	76		71																				5
	B	206	6	6	192																			8
	C	207	13		13	173																		21
	D	14	6			6	6																	2
OPER	Total	1199	240																					
	A	14	3	3*					10															1
	B	368	28	6	16*				6	325														15
	C	635	103		13	25*				65	468													64
	D	182	106			6	5*			19	76	45												31
LAB	Total	150	20																					
	A	10												9										1
	B	70	2											2	65									3
	C	47	10												10	32								5
	D	23	8												2	6	11							4
MAINT	Total	233	21																					
	A	4																	4					0
	B	54	1																1	51				2
	C	126	7																	7	106			13
	D	49	13																	2	11	28		8
Total Transfers In		306		15	42	37	5	Total 99	6	84	76		Total 166	2	12	6		Total 20	1	9	11		Total 21	
Total New Hires		463				25	5	30		9	177	161	347		2	15	15	32		1	26	27	54	
End of Period Total		2365		86	234	235	16	571	16	418	721	206	1361	11	79	53	26	169	5	61	143	55	264	

Begin of Period Jan., '78

End of Period Jan., '79

MANPOWER TRANSITION ANALYSIS
(For Plants With Average Flows of <1MGD)

Occupation	Certification Grade	Begin of Period Total	Total Transfers Out	Supervisor					Operator					Lab Technician					Maintenance					Total Separations
				A	B	C	D		A	B	C	D		A	B	C	D		A	B	C	D		
		1309	110																					
SUPV	Total	772	20																					
	A	14		12																				2
	B	171	1	1	156																			14
	C	475	11		11	407																		57
	D	112	8			8	98																	6
OPER	Total	413	87																					
	A	3	1	1*					1															1
	B	66	4		2*				2	56														6
	C	221	43		5	30*				8	152													26
	D	123	39			7	8*			2	22	78												6
LAB	Total	13	1																					
	A	0												0										0
	B	5													4									1
	C	5	1												1	4								0
	D	3															3							0
MAINT	Total	111	2																					
	A	0																	0					0
	B	7																		7				0
	C	68																			60			8
	D	36	2																		2	33		1
Total Transfers In		110		2	18	45	8	Total 73	2	10	22		Total 34		1			Total 1			2		Total 2	
Total New Hires		148				30	8	38		1	50	47	98			1		1			7	4	11	
End of Period Total		1329		14	174	482	114	784	3	67	224	125	419	0	5	5	3	13	0	7	69	37	113	

Begin of Period Jan., '78

End of Period Jan., '79

MANPOWER TRANSITION ANALYSIS
(For Plants With Average Flows of >1MGD)

Occupation	Certification Grade	Begin of Period Total	Total Transfers Out	Supervisor					Operator					Lab Technician					Maintenance					Total Separations
				A	B	C	D		A	B	C	D		A	B	C	D		A	B	C	D		
		2365	316																					
SUPV	Total	571	25																					
	A	86		81																				5
	B	234	6	6	219																			9
	C	235	13		13	199																		23
	D	16	6			6	7																	3
OPER	Total	1361	248																					
	A	16	3	3*					12															1
	B	418	29	6	17*				6	373														16
	C	721	106		13	26*				67	543													72
	D	206	110			6	6*			19	79	61												35
LAB	Total	169	19																					
	A	11												11										0
	B	79	1											1	75									3
	C	53	9												9	39								5
	D	26	9												3	6	12							5
MAINT	Total	264	24																					
	A	5																	4					1
	B	61	2																2	57				2
	C	143	8																	8	121			14
	D	55	14																	2	12	31		10
Total Transfers In		316		15	43	38	6	Total 102	6	86	79		Total 171	1	12	6		Total 19	2	10	12		Total 24	
Total New Hires		484				26	5	31		9	185	169	363		1	14	17	32		1	27	30	58	
End of Period Total		2645		96	262	263	18	639	18	468	807	230	1523	12	88	59	29	188	6	68	160	61	295	

Begin of Period Jan. '79

End of Period Jan. '80

MANPOWER TRANSITION ANALYSIS
(For Plants With Average Flows of <1MGD)

Occupation	Certification Grade	Begin of Period Total	Total Transfers Out	Supervisor					Operator					Lab Technician					Maintenance					Total Separations
				A	B	C	D		A	B	C	D		A	B	C	D		A	B	C	D		
		1329	107																					
SUPV	Total	784	19																					
	A	14		12																				2
	B	174	1	1	159																			14
	C	482	10		10	414																		58
	D	114	8			8	101																	5
OPER	Total	419	85																					
	A	3	1	1*					1															1
	B	67	4		2*				2	58														5
	C	224	42		5	30*				7	155													27
	D	125	38			7	7*			2	22	81												6
LAB	Total	13	1																					
	A	0												0										0
	B	5													4									1
	C	5	1												1	4								0
	D	3															3							0
MAINT	Total	113	2																					
	A	0																	0					0
	B	7																		7				0
	C	69																			61			8
	D	37	2																		2	33		2
Total In Transfers		107		2	17	45	7	Total 71	2	9	22		Total 33		1			Total 1			2		Total 2	
Total New Hires		146				30	7	37		1	50	46	97			1		1			7	4	11	
End of Period Total		1346		14	176	489	115	794	3	68	227	127	425	0	5	5	3	13	0	7	70	37	114	

Begin of Period Jan. '79

End of Period Jan. '80

MANPOWER TRANSITION [illegible]
(For Plants With Average Flows of
≥1MGD)

Occupation	Certification Grade	Begin of Period Total	Total Transfers Out	Supervisor					Operator					Lab Technician					Maintenance					Total Separations
				A	B	C	D		A	B	C	D		A	B	C	D		A	B	C	D		
		2645	328																					
SUPV	Total	639	26																					
	A	96		91																				5
	B	262	6	6	245																			11
	C	263	13		13	224																		26
	D	18	7			7	8																	3
OPER	Total	1523	255																					
	A	18	3	3*					14															1
	B	468	29	6	18*				5	420														19
	C	807	108		13	26*				69	619													80
	D	230	115			7	6*			20	82	76												39
LAB	Total	188	24																					
	A	12												11										1
	B	88	3											3	81									4
	C	59	11												11	42								6
	D	29	10												3	7	14							5
MAINT	Total	295	23																					
	A	6																	5					1
	B	68	1																1	64				3
	C	160	8																	8	136			16
	D	61	14																	2	12	37		10
Total Transfers In		328		15	44	40	6	Total 105	5	89	82		Total 176	3	14	7		Total 24	1	10	12		Total 23	
Total New Hires		509				26	6	32		10	192	179	381		2	16	18	36		1	28	31	60	
End of Period Total		2924		106	289	290	20	705	19	519	893	255	1686	14	97	65	32	208	6	75	176	68	325	

Begin of Period Jan. '80

End of Period Jan. '81

MANPOWER TRANSITION ANALYSIS
(For Plants With Average Flows of <1MGD)

Occupation	Certification Grade	Begin of Period Total	Total Transfers Out	Supervisor					Operator					Lab Technician					Maintenance					Total Separations
				A	B	C	D		A	B	C	D		A	B	C	D		A	B	C	D		
		1346	113																					
SUPV	Total	794	19																					
	A	14		12																				2
	B	176	1	1	161																			14
	C	489	10		10	420																		59
	D	115	8			8	101																	6
OPER	Total	425	90																					
	A	3	1	1*					2															0
	B	68	5	1	2*				2	57														6
	C	227	44		5	31*				8	155													28
	D	127	40			7	7*			3	23	80												7
LAB	Total	13	1																					
	A	0												0										0
	B	5													5									0
	C	5	1												1	3								1
	D	3															2							1
MAINT	Total	114	3																					
	A	0																	0					0
	B	7																		7				0
	C	70	1																	1	60			9
	D	37	2																		2	33		2
Total Transfers In		113		3	17	46	7	Total 73	2	11	23		Total 36		1			Total 1		1	2		Total 3	
Total New Hires		158				31	8	39		1	53	48	102			2	1	3			9	5	14	
End of Period Total		1369		15	178	497	116	806	4	69	231	128	432	0	6	5	3	14	0	8	71	38	117	

Begin of Period Jan. '80

End of Period Jan. '81

MANPOWER TRANSITION ANALYSIS
(For Plants With Average Flows of
>1MGD)

Occupation	Certification Grade	Begin of Period Total	Total Transfers Out	Supervisor					Operator					Lab Technician					Maintenance					Total Separations
		2924	347	A	B	C	D		A	B	C	D		A	B	C	D		A	B	C	D		
SUPV	Total	705	28																					
	A	106		99																				7
	B	289	7	7	270																			12
	C	290	14		14	246																		30
	D	20	7			7	9																	4
OPER	Total	1686	273																					
	A	19	4	4*					14															1
	B	519	31	7	18*				6	467														21
	C	893	115		14	29*				72	688													90
	D	255	123			7	7*			21	88	89												43
LAB	Total	208	23																					
	A	14												14										0
	B	97	2											2	91									4
	C	65	11												11	47								7
	D	32	10												3	7	20							2
MAINT	Total	325	23																					
	A	6																	6					0
	B	75																		72				3
	C	176	8																	8	150			18
	D	68	15																	2	13	41		12
Total Transfers In		347		18	46	43	7	Total 114	6	93	88		Total 187	2	14	7		Total 23		10	13		Total 23	
Total New Hires		537				28	6	34		10	204	191	405		2	17	15	34		1	29	34	64	
End of Period Total		3207		117	316	317	22	772	20	570	980	280	1850	16	107	71	35	229	6	83	192	75	356	

TAB B, EXHIBIT 2-2

*** TEXAS WATER QUALITY BOARD ***

DISTRICT 1
FLOW LESS THAN 1 MGD

MANPOWER MOVEMENT ANALYS

MUNICIPAL

CERTIFICATION CHANGES

CLASSIFICATION CHANGES

	D-D	D-C	D-B	D-A	D-U	C-D	C-C	C-B	C-A	C-U	B-D	B-C	B-B	B-A	B-U	A-D	A-C	A-B	A-A	A-U	U-D	U-C	U-B	U-A	U-U
1-1	6	1	0	0	0	0	32	3	0	0	0	0	12	0	0	0	0	0	0	0	0	0	0	0	0
1-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-U	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
2-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-2	5	0	0	0	0	0	2	1	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	1
2-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-U	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
3-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-U	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4-4	2	0	0	0	0	0	3	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2
4-U	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
U-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1
U-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	0	0	0
U-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
U-4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
U-U	5	0	0	0	0	0	15	0	0	0	0	0	3	0	0	0	0	0	0	0	0	1	0	0	2

ROW	1-1	1-2	1-3	1-4	1-U	2-1	2-2	2-3	2-4	2-U	3-1	3-2	3-3	3-4	3-U	4-1	4-2	4-3	4-4	4-U	U-1	U-2	U-3	U-4	U-U
TOTAL	54	0	0	0	2	0	12	0	0	3	0	0	0	0	0	0	0	0	9	0	3	5	1	3	26

COL	D-D	D-C	D-B	D-A	D-U	C-D	C-C	C-B	C-A	C-U	B-D	B-C	B-B	B-A	B-U	A-D	A-C	A-B	A-A	A-U	U-D	U-C	U-B	U-A	U-U
TOTAL	18	1	0	0	0	0	52	4	0	3	0	0	20	0	1	0	0	0	0	0	4	5	0	0	10

*** TEXAS WATER QUALITY BOARD ***

DISTRICT 1
FLOW GREATER THAN 1 MGD

MANPOWER MOVEMENT ANALYS

CERTIFICATION CHANGES

	D-D	D-C	D-B	D-A	D-U	C-D	C-C	C-B	C-A	C-U	B-D	B-C	B-B	B-A	B-U	A-D	A-C	A-B	A-A	A-U	U-D	U-C	U-B	U-A	U-U
1-1	0	0	0	0	0	0	5	1	0	0	0	0	4	0	0	0	0	0	6	0	0	0	0	0	4
1-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C 1-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
L 1-4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
A 1-U	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
S 2-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S 2-2	4	0	1	0	0	0	12	2	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	1
I 2-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F 2-4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
I 2-U	0	0	0	0	0	0	0	0	0	5	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
C 3-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
A 3-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T 3-3	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
I 3-4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O 3-U	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N 4-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C 4-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
H 4-4	0	0	0	0	0	0	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
A 4-U	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	0	0	0	0	0
N U-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G U-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0
E U-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
S U-4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
U-U	1	0	0	0	0	0	5	1	0	3	0	0	5	0	0	0	0	0	2	0	0	2	1	0	4

ROW	1-1	1-2	1-3	1-4	1-U	2-1	2-2	2-3	2-4	2-U	3-1	3-2	3-3	3-4	3-U	4-1	4-2	4-3	4-4	4-U	U-1	U-2	U-3	U-4	U-U
TOTAL	20	0	0	0	2	0	30	0	0	6	0	0	1	0	0	0	0	0	3	3	0	4	1	1	24

COL	D-D	D-C	D-B	D-A	D-U	C-D	C-C	C-B	C-A	C-U	B-D	B-C	B-B	B-A	B-U	A-D	A-C	A-B	A-A	A-U	U-D	U-C	U-B	U-A	U-U
TOTAL	5	0	1	0	0	0	24	4	0	9	0	0	21	0	3	0	0	0	8	2	2	6	1	0	9

7

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                                   * * *  T E X A S   W A T E R   Q U A L I T Y   B O A R D  * * *

DISTRICT  2                                        MANPOWER MOVEMENT ANALYS
FLOW      LESS THAN 1 MGD
                                                    CERTIFICATION CHANGES

           D-D   D-C   D-B   D-A   D-U   C-D   C-C   C-B   C-A   C-U   B-D   B-C   B-B   B-A   B-U   A-D   A-C   A-B   A-A   A-U   U-D   U-C   U-B   U-A   U-U
    1-1      6     0     0     0     0     0    39     0     0     0     0     0     9     0     0     0     0     0     3     0     0     1     0     0     0
    1-2      0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
  C 1-3      0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
  L 1-4      0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
  A 1-U      0     0     0     0     0     0     0     0     0     1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
  S 2-1      0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
  S 2-2      5     0     0     0     0     0    22     0     0     0     0     0    11     0     0     0     0     0     0     0     0     0     0     0     0
  I 2-3      0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
  F 2-4      0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
  I 2-U      0     0     0     0     0     0     0     0     0     1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
  C 3-1      0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
  A 3-2      0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
  T 3-3      0     0     0     0     0     0     1     0     0     0     0     0     1     0     0     0     0     0     0     0     0     0     0     0     0
  I 3-4      0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
  O 3-U      0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
  N 4-1      0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    4-2      0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
  C 4-3      0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
  H 4-4      1     0     0     0     0     0     2     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     3
  A 4-U      0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
  N U-1      0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     1     0     0     0     2
  G U-2      0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     1     0     0     2
  E U-3      0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
  S U-4      0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    U-U      3     0     0     0     0     0    16     0     0     1     0     0     6     0     0     0     0     0     1     0     1     2     0     0     7


    ROW    1-1   1-2   1-3   1-4   1-U   2-1   2-2   2-3   2-4   2-U   3-1   3-2   3-3   3-4   3-U   4-1   4-2   4-3   4-4   4-U   U-1   U-2   U-3   U-4   U-U
  TOTAL     58     0     0     0     1     0    38     0     0     1     0     0     2     0     0     0     0     0     6     0     3     3     0     0    37


    COL    D-D   D-C   D-B   D-A   D-U   C-D   C-C   C-B   C-A   C-U   B-D   B-C   B-B   B-A   B-U   A-D   A-C   A-B   A-A   A-U   U-D   U-C   U-B   U-A   U-U
  TOTAL     15     0     0     0     0     0    80     0     0     3     0     0    27     0     0     0     0     0     4     0     2     4     0     0    14
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*** TEXAS WATER QUALITY BOARD ***

DISTRICT 2
FLOW GREATER THAN 1 MGD

MANPOWER MOVEMENT ANALYS

CERTIFICATION CHANGES

	D-D	D-C	D-B	D-A	D-U	C-D	C-C	C-B	C-A	C-U	B-D	B-C	B-B	B-A	B-U	A-D	A-C	A-B	A-A	A-U	U-D	U-C	U-B	U-A	U-U
1-1	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	1	0	0	0	0	0	1
1-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C 1-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
L 1-4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
A 1-U	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S 2-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S 2-2	0	0	0	0	0	0	6	1	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0
I 2-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F 2-4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
I 2-U	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
C 3-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
A 3-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T 3-3	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
I 3-4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O 3-U	0	0	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N 4-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C 4-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
H 4-4	1	0	0	0	0	0	5	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
A 4-U	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N U-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G U-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E U-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
S U-4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
U-U	1	1	0	0	0	0	4	0	0	0	0	0	9	0	1	0	0	0	1	0	0	1	1	0	1

ROW	1-[illegible]	1-2	1-3	1-4	1-U	2-1	2-2	2-3	2-4	2-U	3-1	3-2	3-3	3-4	3-U	4-1	4-2	4-3	4-4	4-U	U-1	U-2	U-3	U-4	U-U
TOTAL	6	0	0	0	1	0	11	0	0	1	0	0	2	0	3	0	0	0	8	2	0	0	1	0	20

COL	D-D	D-C	D-B	D-A	D-U	C-D	C-C	C-B	C-A	C-U	B-D	B-C	B-B	B-A	B-U	A-D	A-C	A-B	A-A	A-U	U-D	U-C	U-B	U-A	U-U
TOTAL	2	2	0	0	2	0	17	1	0	3	0	0	19	0	2	0	0	0	2	0	0	1	2	0	2

```
                         * * *  T E X A S   W A T E R   Q U A L I T Y   B O A R D  * * *

                                        MANPOWER MOVEMENT ANALYS

                                            STATEWIDE TOTALS

                                         CERTIFICATION CHANGES
                                                LOW FLOW

D-D  D-C  D-B  D-A  D-L  C-D  C-C  C-B  C-A  C-U  B-D  B-C  B-B  B-A  B-U  A-D  A-C  A-B  A-A  A-L  U-D  U-C  U-B  U-A  U-U

187   11    0    0   23    0  612   17    0   91    0    0  197    1   25    0    0    0   16    3   33   44    5    0  125

                                                HIGH FLOW

160   11    2    0    0    0  767   36    0    0    0    0  511    7    0    0    0    0   76    0   30   73   16    1  122

                                         CLASSIFICATION CHANGES

                                                LOW FLOW

1-1  1-2  1-3  1-4  1-U  2-1  2-2  2-3  2-4  2-U  3-1  3-2  3-3  3-4  3-U  4-1  4-2  4-3  4-4  4-U  U-1  J-2  U-3  U-4  U-U

513    0    0    0   33    0  275    0    0   57    0    0    7    0   11    0    0    0   82   14   26   23    1   10  338

                                                HIGH FLOW

306    0    0    0    2    0  698    0    0    1    0    0   74    0    0    0    0    0  142    0   13   56    7   13  500
```

TAB B

EXHIBIT 3 - EXPLANATION OF CODES AND TERMS USED ON TEXAS WATER QUALITY BOARD MANPOWER ANALYSIS COMPUTER PRINTOUTS FOR WASTEWATER TREATMENT PLANT CERTIFIED PERSONNEL

Explanation of Codes and Terms Used on Texas Water Quality Board Manpower Analysis Computer Printouts for Wastewater Treatment Plant Certified Personnel

SSN - Social Security Number

City-ID - eight digit code identifying the location of the wastewater system (first three digits identify the county, next three identify the entity's sequence within the county, and last two identify separate systems, if more than one, within the entity)--(sequence code rarely used)

G - certification grade
4 = A (highest)
3 = B
2 = C
1 = D
Blank = unknown grade which indicates a coding error or people working in wastewater who do not have a wastewater certificate

POS - wastewater position code (these positions have been grouped into the following wastewater occupations)

Supervisor

30 - director of utilities
60(34)*- wastewater superintendent
62(35) - wastewater plant superintendent
70(40) - assistant wastewater superintendent

Operator

63(36)-wastewater plant operator
64(39)-lift station operator
68 - industrial waste operator

Lab

31 - chemist
32 - biologist
33 - laboratory technician
67 - water quality analyst

Maintenance

66 - instrument technician
69(38)- maintenance

Additional listings for:

65(41) collection system serviceman**
97 - retired
98 - unemployed
99 - not employed in wastewater

EXP-DTE - expiration date of certificate (see enclosed Texas Department of Health Resources blue sheet for a description of the requirements and length of validity for each certification grade)

DIS - Texas Water Quality Board district

SY - type of system:
2 = wastewater only
3 = both water and wastewater

CL - occupational class:

0 = not active in wastewater
1 = supervisor
2 = operator
3 = laboratory
4 = maintenance
blank = unknown position code which indicates one of three things:
  1) coding error
  2) one of the previously listed wastewater positions which is not included in one of the four occupations
  3) people who have wastewater certificates but are working in water systems and thus have water positions

BY - year of birth

ED - education level:

01 = grammar school
02 = two years of high school
03 = high school graduate
04 = high school GED or equivalent
05 = one year of college
06 = two years of college
07 = BS
08 = MS or PhD

EXP - years of experience in wastewater

F - flow in average million gallons per day (MGD):

0 = $<$ 1MGD
1 = $\geq$ 1MGD

HHED - total number of water and wastewater training credits (structure of certification file did not allow for separate listings of water and wastewater credits)

DUTY - four digit code with first two digits identifying a wastewater duty and last two digits identifying the number of years employed at that particular duty

CONT - contract service code of the contracting company providing wastewater services to an entity

CATG - wastewater system category (all of the wastewater systems listed in the certification file have been grouped into one of the following categories):

1 - municipal (includes subdivision, trailer park, etc.) (1159 entries)
2 = other public service organization (includes airports, restaurants, state park, other recreational areas, school districts, etc.) (160 entries)
3 = industry (incomplete listings) (97 entries)
4 = federal entity (includes national parks and military installations) (47 entries)

*A position code in parenthesis identifies a person working in both wastewater and water. Each person with such a code was counted as working in wastewater, due to the fact that the structure of the certification file did not allow for the determination of the percentage of time spent in wastewater or water.

**This position was not grouped into one of the four major occupations in an effort to remain consistent with the staffing projections obtained from the Texas Water Quality Board construction grant files. These staffing projections focused on wastewater treatment personnel only and excluded any projections for additional collection system service staff needed. (Note: an error was made in including the lift station operator 64(39) in the operator occupation. This position code will be separated from the operator category in future manpower analyses.)

TAB B, EXHIBIT 3-1

WASTEWATER MASTER FILE MUNICIPAL

FORM TJ0005 *** TEXAS WATER QUALITY BOARD *** PAGE 001

SSN	CITY-ID	G	POS	EXP-DTE	DIS	SY	CL	NAME	RY	ED	EXP	F	YAS	HHED	DJTY	CONT	CATG
017016244	05708201	1	36	062077	04	3	2	GRAVES ALLEN W	14	06	04	0	01	0066	5001		1
018267627	14000301	1	63	111477	01	3	2	GARNEY BRIAN R	43	03	01	1	01	0020	5001		1
020268348	04900101	3	41	072877	04	3		YOUNG CHARLES R	33	06	18	1	14	0161	5214		1
021280917	06200101	2	40	101077	08	3	1	FIELDING ROBERT A	36	04	03	1	01	0096	5501		1
044287836	11600401	3	63	091079	05	3	2	TOUHEY DONALD W JR	30	04	05	1	02	0223	5601		1
048077894	24600101	2	62	031977	03	3	1	KOZIK STANLEY F	21	03	07	0	01	0219	5601		1
061187250	09500101	2	05	051573	03	3		MISTRETTA SAMUEL A	25	04	03	0	03	0000	5703		1
073469829	22800201	2	40	082678	06	3	1	PATCHETT PHILLIP R	54	03	03	0	01	0100	5601		1
073486363	08400301	3	62	101876	07	3	1	CHANG DISON	41	08	04	1	04	0065	5500		1
080269603	17800301	3	69	052880	12	3	4	MACKENZIE WESLEY A	33	04	04	1	01	0128	5701		1
083125535	12000101	2	30	040675	12	3	1	OTTLEY HUGH L	22	06	05	0	02	0020	5602		1
094016291	20202001	2	34	051576	06	3	1	MURRAY CHESTER D	13	02	12	0	00	0052	5008		1
104140603	01501801	3	63	050178	08	3	2	RUGGLE HOWARD A	22	03	06	1	01	0092	5003		1
114408143	05701501	2	63	091177	04	3	2	GOODFELLOW ROBERT J	48	06	04	1	02	0064	5502		1
11620408[illegible]	10101301	2	63	041178	07	3	2	BIERMAN LEE M	29	03	04	1	00	0032	5000		1
116262267	07100201	4	65	000000	10	3		CLARKE RAYMOND G		08	12	1	08	0135	5208		1
117241250	11700101	3	63	111480	01	3	2	OSULLIVAN JOHN J	32	04	04	1	01	0099	5001		1
125202011	05700401	2	05	101678	04	3		SENNETT GEORGE A	31	05	04	1	03	0133			1
135405698	22006601		30		04	3	1	FENDA OSCAR	45	07	05	0	00	0095	5100		1
139361135	05400201	1	63	091177	08	3	2	LOPEZ HECTOR M	36	04	01	1	00	0040	5000		1
141401821	10200301	2	40	091677	05	3	1	BOWMAN KEVIN T	49	07	02	0	00	0024	5001		1
141409891	22001201	2	63	011578	04	3	2	KIZAKAVICH ALAN T	48	03	03	1	01	0040	5001		1
147424870	22700101	1	31	032777	03	3	3	HAWK GREGORY C	51	07	01	1	00	0060	5400		1
150120023	22700101	2	69	032778	03	3	4	KUNATH RICHARD A	26	03	02	1	01	0040	5701		1
154037559	18400301	2	34	071576	04	3	1	CHERRY JOHN H	19	07	14	0	09	0158	5609		1
159242584	05701001	3	63	062176	04	3	2	BRADY C WILLIAM	22	03	07	1	03	0120	5603		1
162200334	22001201	3	63	120976	04	3	2	GRIFFITH JAMES F	25	03	07	1	03	0195	5403		1
163365639	10900101	2	34	011575	03	3	1	BRISTOW CARL R	16	02	16	1	12	0000	5612		1
165149493	22009501	3	30	060878	04	2	1	STOLL HARRY J	22	07	04	0	05	0020	5605		1
166163217	18[illegible]	2	69	032477	01	3	4	WINSOR EDWIN L	19	03	05	1	01	0062	5701		1
178245414	24300501	3	01	041580	04	3		SPRULE EDWARD P	29	03	27	1	[illegible]	0281	5500		1
179125991	11200201	2	26	102377	05	3	2	METALLO JAMES P	16	03	03	1	01	0282	5601		1
185167452	10101301	2	63	111576	07	3	2	HUGHES LEROY OWEN	27	04	13	1	06	0120	5007		1
189097333	07100201	3	41	121578	10	3		HUNSICKER JOHN C	18	07	29	1	15	0116	5225		1
18930870[illegible]	[illegible]	2	06	071276	14	3		PETRUNA NICHOLAS C	37	05	10	1	09	0040	5505		1
191180585	11300201	1	34	031277	06	3	1	SLOCUM SCOTT F	23	02	02	0	01	0104	5601		1
194405937	10101301	3	36	09086	07	3	2	KESSLER ROBERT L	52	04	03	1	00	0086	5601		1
209037379	05701501	2	99	021579	04	3	3	SCHAUB CLARENCE H	15	02	04	1	24	0050			1
211242017	10101301	2	63	11156[illegible]	07	3	2	GRUBE JOHN G	32	03	09	1	01	0288	5005		1
212345789	03106401	1	63	112177	11	2	2	FOWLER LEONARD S	36	03	02	0	01	0024	5001		1
[illegible]	13[illegible]	1	41	122775	08	3		POSEY CHARLES P	14	01	12	1	09	0074	5608		1
216729745	16[illegible]	4	38	[illegible]	10	3	4	VALDEZ JOSE C	25		14	1		0149	5712		1

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FORM TJ0005              *** T E X A S   W A T E R   C U A L I T Y   B O A R D ***                      PAGE 0

     SSN        CITY-ID   G  POS EXP-DTE DIS SY CL NAME                           BY  ED  EXP F  YAS WHED  DUTY  CONT  C

   221360620  09100601  2  03  021479  04  3     ADAMS LOUIS J                  46  03  04  1  01  0140  5101
   224528554  10800601  1  63  112177  11  3  2  VALLE THOMAS A                 30  01  01  1  00  0020  5100
   225162000  22600101  3  99  021578  09  3  0  WILLIAMS CHARLES L             17  07  26  1  23  0096

   226543830  10102601  2  03  013675  07  3     ADAMS KEN RAY                  42  03  02  0  00  0026
   227225918  10138301  2  36  061576  07  3  2  BAILEY FLOYD N                 25  01  20  0  10  0096  5616  0000
   227667039  05704801  2  64  061778  04  3  2  RICHARDS ELLIOT M              47  04  03  1  02  0036  5102

   228345144  24300101  2  63  112176  04  3  2  RAINEY JAMES R JR              33  03  01  1  00  0050  5000
   228642233  10106201  2  70  060478  07  3  1  HOPPER WILLIAM LEE             46  04  02  1  01  0100  5601
   235363407  05706101     40          04  3  1  MONTGOMERY LENARD A            27  02  03  0  03  0020  5203

   235446706  22100101  2  63  051577  02  3  2  HALL DENNIS W                  30  03  03  0  01  0060  5001
   235480326  05701001  3  63  082776  04  3  2  PRUNTY LAWRENCE E              32  03  04  1  06  0156
   235583465  02900201  3  30  032978  12  3  1  BRADLEY CLAUDE                 37  05  15  1  00  0392  5411

   236223613  22001201  3  36  121978  04  3  2  SPENCER CARLESS C              23  04  09  1  01  0080  5604
   238706648  10101501  2  30  122177  07  3  1  STRICKLAND JIMMY E             43  03  12  1  08  0166  5508
   240809832  10100501  2  36  081576  07  3  2  BELL JOHN RUSSELL JR           50  03  07  0  04  0161  5003

   241469053  22  001 1  3  41  022678  04  3     JEFFRIES DOUGLAS C             34  06  04  0  01  0161  5201
   242967808  15505301  2  31  071677  03  2  3  WHITTINGTON HAYDEN M           54  03  03  1  01  0102  5401
   244521489  05700401  3  06  101578  04  3     SUDDRETH RICHARD E             37  05  06  1  08  0160

   245541221  01400301  2  34  030377  03  3  1  PITTMAN HARVEY D               37  03  06  0  02  0090  5001
   245606587  01501801  2  63  080776  08  3  2  HUGHES ROBERT E L              33  04  05  1  00  0078  5000
   248361613  22600101  3  02  092877  09  3     JACKSON RICHARD E              28  07  04  1  08  0192        1314

   249262378  22100101  2  63  051579  02  3  2  STEADMAN LEMUEL C              21  04  06  0  02  0062  5002
   250929339  05701501  2  63  091178  04  3  2  JONES RONALD E                 52  04  02  1  01  0040  5001
   256408395  22005401  2  40  031579  04  3  1  ALLEN ELMO                     28  05  07  1  00  0184  5203

   261588537  17805301  4  60  010000  12  3  1  BLANCHARD MELVIN               40  06  12  1  01  0101  5601
   261869870  21000301  2  34  060676  06  3  1  FLEMING MICKEY H               50  03  06  0  01  0041  5601
   262620799  05750401  2  39  111675  04  3  2  BRIAN JAMES P                  41  03  05  1  02  0040  5702

   262647075  05700801  1  60  062074  04  3  1  TINER BERNADINE G              39  05  03  0  01  0022  5201
   263167614  22800201  2  30  082678  06  3  1  GARDNER EDWIN L                21  04  03  0  01  0100  5601
   263604746  14800101     40          09  3  1  MCINTOSH BENJAMIN F            35  05  01  0  01  0052  5601

   265101916  08400801  3  63  100576  07  3  2  KLEIN CHARLES L                10  03  14  1  09  0060  5009
   265302778  24300101  1  63  090877  04  3  2  BROWN HERMAN                   27  03  03  1  01  0020  5001
   266342248  11400101  4  30  010000  02  3  1  BROWN WILLIS V                 29  05  07  0  23  0245  5603

   266726016  227  1 1  3  63  013079  03  3  2  JOHNSON MICHAEL K              42  03  06  1  02  0100  0250
   267030663  10102301  2  34  111576  07  3  1  MONROE CHARLES W               17  03  15  0  11  0040  5610
   267402455  08400301  2  63  011878  07  3  2  BRADLEY JOHN HENRY             35  04  05  1  01  0252  5001

   269096735  22700101  4  62  000000  03  3  1  PFAFFMAN ROBERT A              18  06  12  1  06  0065  5407
   271403644  03100201  2  64  102675  11  3  2  ROBLES RENE V                  46  04  04  1  01  0082  5101
   273402645  22100101  2  63  052179  02  3  2  HOUSE JAMES F                  49  03  04  0  01  0071  5001

   274169317  05100301  3  30  061780  04  3  1  INGRAM ROBERT H                14  03  05  0  01  0264  5601
   277227571  03104501  1  62  071675  11  2  1  DE SANTE GILBERT F             04  03  02  0  00  0023  5600
   278162962  01400401  1  64  102477  03  3  2  RHODUS WALTER W                22  04  02  1  00  0060  5701
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       SSN          CITY-ID     G  PCS EXP-DTE DIS SY CL NAME                        BY  ED  EXP F  YAS MHED  DUTY   CONT  CA

       278226843    22008101       40          04  3  1  WARNER JAMES D              28  03  01  1  02  0020  5201
       279349489    12900401    3  98  040879  04  3  0  JOHNSON JOSEPH M JR         40  03  06  0  03  0104  5001
       281160364    09101601    2  36  021479  04  2  2  SANDERSON PAUL H            22  03  07  0  04  0040  5604

       281269935    13900301       60          05  3  1  HOLLAND FRANK E             31  03  08  0  02  0020  5003
       286500940    03100301       36          11  3  2  COMACHO ADAN                54  04  01  0  01  0100  5501
       287206278    07100201    3  60  031578  10  3  1  SIMPSON ERNEST F            10  01  25  1  18  0036  5116

       294052679    08402001    1  34  121772  07  3  1  TARBET DONALD J             21  03  03  0  02  0000  5602
       294320758    22300101    3  39  120876  02  3  2  MILLICAN ROBERT J           38  04  08  0  03  0106  5003
       294385374    22000101    2  05  101576  04  3     FREY RUSSELL C              44  06  04  0  00  0143

       294388034    22100101    3  63  051480  02  3  2  FISHER RAY E                43  03  08  0  04  0082  5004
       295167949    10129301    2  63  041178  07  3  2  LAW TALLIE W JR             23  03  02  1  01  0040  5001
       297329092    10801101    3  38  080579  11  3  4  GERALD RALPH M              37  07  02  1  00  0152  5100

       300249879    18200101    1  63  072977  04  3  2  MACE KENNETH F              21  06  01  1      0020  5600
       303202331    05701001    3  99  091571  04  3  0  ROMINGER RICHARD W          25  06  05  1  09  0000
       306164913    17800301    3  63  111575  12  3  2  ASHLEY HORACE T             14  03  16  1  13  0014  5510

       306281978    14100101    1  63  091977  03  3  2  DE BOLD JEROME              31  04  04  1  02  0042  5002
       306506296    09000301    3  04  111879  01  3     RODGERS LEONARD A           44  04  02  1  04  0284
       308329603    24500101    1  30  011677  11  3  1  CAME BILL J                 35  07  02  1  00  0044  5600

       309346053    08402001    2  36  020478  07  3  2  MATCHETTE SIDNEY            34  03  05  0  01  0100  5001
       309607253    22200101    1  38  120277  10  3  4  BAHLOW FOY J                54  03  01  0  00  0020  5700
       310145736    12600401       34          04  3  1  HAMANN CHARLES W            21  03  09  0  00  0040  5500

       310468350    01501801    2  65  042077  08  3     OSIO ARDIAS M               46  03  09  1  03  0056  5202
       311013556    05500101       30          10  3  1  BALL EARL L                 19  03  03  0  03  0000  5603
       312269500    22100101    2  63  051176  02  3  2  LOVELL JAMES W              28  03  07  0  03  0103  5003

       312302231    21200401    1  63  021676  05  3  2  PITTILLO BERNEST F          28  01  21  1  16  0008  5016
       312322854    07100201    3  64  050681  10  3  2  RYAN MARION D               35  04  15  1  13  0130  5117
       312424651    02700301    2      071875  03  3     LEMING JAMES C              42  06  05  1  00  0112         1230

       312567775    09100501       04          04  3     MICHAEL RICHARD E           51  03      0  00  0020  5100
       313508014    22700101    2  63  090878  03  2  2  SCHAFER BRUCE E             46  03  01  1  00  0078  5000   0009
       315261898    24300101    3  33  071577  04  3  3  PENNINGTON ELTON A          22  04  06  1  06  0369

       316050399    08400301    3  62  110176  07  3  1  WISE DUDLEY S               10  03  04  1  03  0106  5601
       319162277    16200101    2  63  052878  04  3  2  MADSEN CHARLES W            22  03  03  1  01  0040  5001
       321203972    01500901    3  36  021578  08  3  1  DOSS ALBERT W               26  03  13  0  05  0120  5604

       321409949    10500101    2  41  071676  08  3     BAUERNFEIND STEVE R         47  07  05  1  02  0110  5202
       325145057    16500101    1  63  111477  10  3  2  BUILTA WARREN E             20  06  01  1  00  0040  5000
       327369064    22001201    2  63  061776  04  3  2  DACCER KENNETH J            15  05  02  1  01  0040  5001

       330056421    30102301    2  36  091575  07  3  1  PETERS MITCHELL E           06  06  07  0  04  0000  5604
       332073313    18800101       34          01  3  1  JENKINS JOSEPH EDWIN        14  08  20  1  06  0114  5208
       334100912    03104501    1  62  071675  11  2  1  ELLINGTON CHARLES W         15  07  02  0  00  0023  5600

       334108690    10200201    2  03  031278  05  3     PEARCE FRED E               23  03  01  1  01  0086
       334203750    15700701    2  35  021275  04  3  2  MERCHANT HAROLD E           26  04  05  1  02  0114  5602
       341367831    17800301    3  63  031980  12  3  2  LOPEZ EFRAIN                44  03  06  1  01  0160  5001
```

TAB B, EXHIBIT 3-2

TEXAS STATE DEPARTMENT OF HEALTH

APPLICATION FOR WATER OR WASTEWATER OPERATOR'S CERTIFICATE

1. Name ______________________________ Last Name First Initial

2. ☐☐☐ ☐☐ ☐☐☐☐ Social Security Number

3. Address ______________________________ Street or P. O. Box City State Zip County

4. Date of Birth ____________ Month Day Year

5. Area Code and Telephone Number ____________

6. If you now have or have previously held a Texas certificate of competency, please furnish the following information:

	Certificate #	Expiration Date	Grade
Water			
Wastewater			

7. Check type and grade of certificate desired. Complete one application for each certificate.

	D	C	B	A*
Water				
Wastewater				

*Important see last page

6a. Do you now have an operator-in-training letter? If yes, is it water ____ or wastewater ____

One of your responsibilities as a certified operator will be to complete reports and records accurately. Your ability to complete this application correctly is a reflection on your competency. Thus, you are encouraged to complete it carefully. All incomplete applications will be returned immediately. When completed, please mail to the Division of Sanitary Engineering, Texas State Department of Health, 1100 West 49th Street, Austin, Texas 78756.

8. Check highest level of education completed:

☐ Grammar School ☐ 2 years of High School ☐ High School ____________ Location Year

☐ Equivalent of High School *(Proof of equivalency must be enclosed.)* ☐ One Year of College

☐ Two Years of College ☐ College Degree and Major ____________ Major

☐ Masters or Doctorate and Major ____________ Major

☐ I have had a previous application approved. Date Approved ____________ Month Year Grade ________ A, B, C or D

Type ____________ Water/Wastewater

(APPLICANTS LEAVE BLANK)

ACTION BY STATE DEPARTMENT OF HEALTH

Education ____________

Years of Experience Approved ____________

Number of Hours Approved ____________

Renewal by Examination ____________

Previous Application Approved ____________

Application Approved ________ Disapproved ________

Examination Grade ____________

Certificate Approved For ____________

Date Certificate Expires ____________

FORM NO. H-41

9. Regional Water Utility Short Schools Attended

School	Dates	Credits
Central West Texas		
U of T at Arlington		
Southwest Texas		
Southeast Texas		
East Texas		
West Texas		
A & M University		
	Total Credits	

10. Texas A&M University Extension Service Courses

Unit No.	Water	Wastewater	Location of School	Date	Credits
				Total Credits	

11. District Association Meetings (List credit by years)

Association Name	Year	Credits

12. Other Water Utility Short Schools

Name	Location	Date	Length of School (in days)

13. Do you work for a water or wastewater service company. If yes, the name and address is

Name Street or P.O. Box City Zip

and the systems it serves are listed in 14 below.

14. Where do you work now? List the utilities or systems where your certificate is to be used to comply with the State Law below:

1. ______________________
Name of System
____
Street or P. O. Box
____
City Zip County Location
Number of Years worked for this system: __________
☐ Water ☐ Wastewater

2. ______________________
Name of System
____
Street or P. O. Box
____
City Zip County Location
Number of years worked for this system: __________
☐ Water ☐ Wastewater

3. ______________________
Name of System
____
Street or P. O. Box
____
City Zip County Location
Number of Years worked for this system: __________
☐ Water ☐ Wastewater

4. ______________________
Name of System
____
Street or P. O. Box
____
City Zip County Location
Number of years worked for this system: __________
☐ Water ☐ Wastewater

If you work for more systems, list them on a separate sheet of paper.

15. Check your present position title below

WATER

		CHECK
Director of Utilities	30	
Water Superintendent	01 [34]	
Water Plant Superintendent	02 [35]	
Water Plant Operator	03 [36]	
Pump Station Operator	04 [39]	
Distribution System Serviceman	05 [41]	
Chemist	31	
Biologist	32	
Laboratory Technician	33	
Instrument Technician	06	
Maintenance	07 [38]	
Assistant Water Superintendent	08 [40]	

WASTEWATER

		CHECK
Director of Utilities	30	
Wastewater Superintendent	60 [34]	
Wastewater Plant Superintendent	62 [35]	
Wastewater Plant Operator	63 [36]	
Lift Station Operator	64 [39]	
Collection System Serviceman	65 [41]	
Chemist	31	
Biologist	32	
Laboratory Technician	33	
Instrument Technician	66	
Water Quality Analyst	67	
Industrial Waste Operator	68	
Maintenance	69 [38]	
Assistant Wastewater Superintendent	70 [40]	
Other		

16. Present Experience – Check the work you now do or supervise and state how long you have been doing it.

WATER

CHECK	DUTIES		HOW LONG
	Water Plant Operator or Maintenance	01	yrs.
	Well System Operator or Maintenance	02	yrs.
	Pump Station or High Lift Pump Operator	03	yrs.
	Distribution System, Maintenance, Construction or Inspection	04	yrs.
	Water Main Tapping, Valve Setting or Meter Setting	05	yrs.
	Chemical or Bacteriological Sampling or Testing	06	yrs.
	Repair or Operation of Instrumentation	07	yrs.
	Maintenance	09	yrs.
	Majority of duties listed above	08	yrs.
			yrs.

WASTEWATER

CHECK	DUTIES		HOW LONG
	Imhoff, Trickling Filter, Activated Sludge, Contact Stabilization, or Extended Aeration Wastewater Treatment Plant Operator	50	yrs.
	Wastewater Pump or Lift Station Operator or Repairman	51	yrs.
	Collection System Construction, Inspection, or Maintenance	52	yrs.
	New Service Connections	53	yrs.
	Chemical or Bacteriological Sampling or Testing	54	yrs.
	Repair or Operation of Instrumentation Equipment	55	yrs.
	Maintenance	57	yrs.
	Majority of duties listed above	56	yrs.
			yrs.

17. Past Experience – List below the work you have done in water and wastewater utilities and closely related fields of employment. (Other employment of no interest.) Start with present position and work back.

DATE (MONTH & YEAR) FROM	TO	NAME OF SYSTEM	WHAT DID YOU DO?

I calculate my actual time of employment in	Years	Months
Water Operations		
Wastewater Operations		

18. Please check the following: In item 2, did you put your social Security Number in the blanks? Without your Water Utility Training credits in items 9, 10, 11, and 12, your application cannot be completed. Did you check your duties and list the length of time you performed each in item 16 and 17?

FOR YOUR RECORDS MAKE A COPY OF THIS APPLICATION

I certify that the information given above is correct to the best of my knowledge.
It is understood that falsification of statements or supporting data may subject any certificate issued herefrom, to cancellation.

AFFIDAVIT

Sworn to and subscribed before me by the above named party ______________________________
Signature of Applicant

this ________ day of ____________________, 19____

______________________________ Notary Public Date ______________________________

in and for ______________________________ County, Texas Place ______________________________

ACTION BY THE COMMITTEE

(Applicants Leave Blank)

Approved	***Key Reason***	***Signature***	***Date***	***Key:***
Yes or No	(If No)			
				1. Insufficient Experience
				2. Insufficient Education
				3. Insufficient Attendance Hours
				4. Experience Not Closely Related to Field
				5. Information Incomplete
				6. Other (State Reason)

*To be completed only by applicants for Grade A certificates.

Please list the name of one or more people who hold Grade A certificates and who are familiar with the type of experience you have.

1. NAME ______________________________
TITLE ______________________________
ADDRESS ______________________________

2. NAME ______________________________
TITLE ______________________________
ADDRESS ______________________________

TAB B, EXHIBIT 3-3

CERTIFICATION OF WATER UTILITIES OPERATORS
Texas State Department of Health
Austin, Texas

GENERAL INFORMATION

Section 11 (a) of the Texas Sanitation and Health Protection Law provides that "No district, municipality, firm, corporation, or individual shall furnish to the public any drinking water for which any charge is made, unless the production, processing, treatment, and distribution is at all times under the supervision of a competent water works operator holding a valid certificate of competency issued under the direction of the Texas State Department of Health."

Section 20 (a) of the Texas Sanitation and Health Protection Law provides that "The management of every public sewerage treatment plant shall employ a sewerage plant operator holding a valid certificate of competency issued under the direction of the Texas State Department of Health. Such sewerage plant operator shall be in charge of said plant. This certificate shall not apply to sewerage treatment plants using septic tanks and subsoil treatment."

This Department issues the following types of water works and sewage works operators' certificates:

Grade D Water and Grade D Sewage (valid for two years)
Grade C Water and Grade C Sewage (valid for three years)
Grade B Water and Grade B Sewage (valid for five years)
Grade A Water and Grade A Sewage (valid for the lifetime of the individual)

None of the above mentioned certificates are issued in specific fields.

TRAINING

Credit toward a certificate is given for attendance at district water utilities association meetings and approved short schools on the following basis:

Area Water Utilities Short Schools (Approved)	1 Credit per class hour of completed courses
District Association Meetings	2 Credits for each meeting
Annual or Regional Short Schools	1 Credit per class hour of completed courses
All-day District Association Meetings	1 Credit per class hour of completed courses
Chlorinator Maintenance and Repair Schools	1/3 actual hours attended

Applicants for Grades C and D certificates must have completed a basic course in their respective fields.

EXAMINATIONS

The examinations offered cover fundamental knowledge of the requirements for a public water supply system or sewerage system, interpretation of bacteriological analysis, selection of pumps, well or surface supply sanitary protection, distribution system sanitation and procedures involved in pipe laying and maintenance, and similar matters. The Grade B also covers the basic engineering functions and computations significant to the operation of a water or sewage plant.

The Grade A examinations are of a difficult nature, involving design as well as water works or sewage works chemistry and bacteriology. The applicant should be prepared to perform fairly difficult engineering computations.

In taking any of the examinations, the applicant may not use any books or references. Material which the applicant will find useful in preparing for the examination includes the **Manual for Water Utility Operations** and the **Manual of Wastewater Operations.**

All arrangements for examinations are made by this Department.

INSTRUCTIONS FOR APPLYING FOR CERTIFICATES

Application should be made on a standard application form. As much information as possible should be given, using supplementary sheets if necessary to give all the details. The application should be signed, notarized, and mailed to the Texas State Department of Health, Division of Environmental Engineering, 1100 West 49th Street, Austin, Texas 78756.

FORM NO. H-48

QUALIFICATION REQUIREMENTS

Certificate	Education	Experience	Training Credit
Grade A	College Degree (Master's)*	4 years	160 hours
	College Degree (Bachelor's)*	5 years	160 hours
	2 Years of College	6 years	160 hours
	High School Graduate or equivalent	8 years	160 hours
Grade B	College Degree (Bachelor's) *	1 year	60 hours
	High School Graduate or equivalent	3 years	100 hours
Grade C	1 Year of College	2 years	
	High School Graduate or equivalent	3 years	
	High School Graduate or equivalent	2 years	20 hours
	High School Graduate or equivalent	1 year	40 hours
Grade D (limited to 250 connections or less)			
	High School Graduate or equivalent		10 hours
	Less than High School Graduate	1 year	
	Less than High School Graduate		20 hours

*College degree with a major in civil ,chemical, mechanical, or sanitary engineering, or in chemistry, biology, or bacteriology.
Credits up to a maximum of 20 training credits are allowed for completion of college courses in chemistry and biology.

EXPERIENCE

Experience must be actual water supply system or sewerage system operation or its approved equivalent and must be in the field applying to the respective certicicates. Experience as foreman or supervisor in most capacities in water and sewerage systems may be considered acceptable. Experience in a purely clerical capacity such as accounting, bookkeeping, or as laborers or meter readers cannot be considered acceptable experience. Listed below are some of the duties which are commonly performed in water and sewage works operation and maintenance and which are considered experience acceptable toward qualification for a water works operator's or a sewage works operator's certificate.

WATER WORKS OPERATION

Supervise water works department, including water works operation
Inspect new water main construction
Install water mains
Install water meters
Make chemical tests of water
Make bacteriological tests of water

Operate or maintain:
- Surface water treatment equipment
- Well pumps and motors
- High lift pumps and motors
- Storage reservoirs
- Hydrants and valves

SEWAGE WORKS OPERATION

Supervise sewage works department, including sewage plant operation
Supervise collection system
Supervise sewage plant modifications
Install or repair collection system
Make bacteriological tests of sewage
Make chemical tests of sewage
Inspect sewage treatment plants

Operate or maintain:
- Imhoff tanks
- Activated sludge plant
- Grit chambers
- Pumps and motors
- Instrumentation equipment
- Sewage collection lines
- Lift stations

RENEWAL OF CERTIFICATES

Grade D, C, and B certificates may be renewed, unless revoked for cause or replaced by one of a higher grade, either by examination or by continuation of training during the time the certificate is valid. For renewal of a certificate without examination, called "renewal by hours substitution," the following requirements shall be met:

1. Application for renewal of a certificate shall be made before the expiration date of the certificate to be renewed.
2. A record of ten (10) hours of credit for a Grade D certificate, twenty (20) hours of credit for a Grade C certificate, and fifty (50) hours of credit for a Grade B certificate shall be acquired during the respective two-year, three-year, or five-year period of validity of the certificates.
3. Before the expiration date of certificates, the holders shall be notified of the expiration date and of how to renew the certificate.

TAB B

EXHIBIT 4 - MANPOWER MOVEMENT RATES

MANPOWER MOVEMENT RATES

Separations:

The following separation rates for the two flow groups (<1MGD and ≥1MGD) were applied without variation to the beginning of period employment for each of the five years. (The same certificate separation rates were applied to all of the four major occupations due to a shortcoming of the "Manpower Movement Analysis" computer matrices (TAB B, Exhibit 2-2). Separation rates for the certificate grades within each occupation will be derived for future analyses). The procedure used in computing the separation rates consisted of the following steps. Copies of the Texas Department of Health Resources wastewater certification and employment computer tapes were obtained for the months of August, 1975 and February, 1976. (The August, 1975 tape was the earliest available tape.) This seven month time period was used as the basis for figuring the number of separations from each certificate grade. These tapes were housed in the Texas Water Quality Board Data Processing Section for purposes of convenience in manipulating the data. These tapes are updated monthly by the Texas Department of Health Resources and are obtainable on such a basis.

Separation rates have certain limitations in that separations include movements to another system category (such as industry), movement to a water system, and movement from one municipal flow group to the other (workers going from the group of plants having average daily flows of less than one million gallons per day (<1MGD) to the group of plants having average daily flows of greater than or equal to one million gallons per day (≥1MGD); see page 3 of the manpower data base flow charts (TAB B, Exhibit 6). In future manpower transition analyses, separate listings will be calculated for these types of movements as well as for actual separations from the wastewater field. (People who leave the field entirely are placed in the "99" job category, retired people are placed in the "97" category, and unemployed people are placed in the "98" category. Individual records are removed from the file only when notification is received of a person's death. See page 5 of the manpower data base flow charts, TAB B, Exhibit 6).

The personnel within each certificate grade for the four occupations were examined to determine the number of those absent from the computer file in February, 1975, who were on the file in August, 1975. Separate analyses were conducted for the two flow groups. Social security numbers were used as identification numbers to ensure that each person was not counted more than once. The separation rate for each certificate grade was figured by dividing the beginning of period employment (August, 1975) into the number who separated. The resulting rates for the seven month period were then inflated to make them applicable for a one-year period. These rates were used throughout the five year analysis. The distribution of workers with an unknown system category into the municipal system category was added to the employment figures on the February, 1976, tape in order to get the current employment for the beginning of the five year analysis (January, 1976 - January, 1977). The separation rates were then applied to the current or beginning of period employment figures for this first year of the five year analysis. The analysis was dated January instead of February in order to signify the beginning of each new year.

The accuracy of these separation rates is dependent upon the Texas Department of Health Resources' system for recording and updating separations. This system consists of two major inputs. One is the number of people who voluntarily inform the Texas Department of Health Resources when they move or leave the field entirely. The second is the data obtained from field surveys of water and wastewater systems that the Texas Department of Health Resources field personnel conduct on a daily basis. It is the judgment of the Texas Water Quality Board's manpower planning staff that the separation rates used in this report are conservative.

Transfers and New Hires:

Due to inaccurate computer output reports concerning manpower movements ("Manpower Movement Analysis", TAB B, Exhibit 2-2) it was necessary to base transfer and new hire rates for each grade within each occupation on the certification exam results of several of the regional short schools. The certification exam application (TAB B, Exhibit 3-2) contains information on previous employment and certification grade, if any, at the time of the application. (See TAB B, Exhibit 3, for an outline of the data collected through use of the certification exam application.) Additional sources of input into the determination of transfer and new hire rates were the judgment of the manpower planner based on his experience in the field and the information obtained from conversations with the Texas Department of Health Resources officers in charge of the certification file. (In many cases, the differences in transfer and new hire rates between the two flow groups are attributable to the number of personnel available to transfer in from other certification grades or other occupations). Future output reports will be refined so as to provide accurate information on the actual number of transfers and new hires occurring during the given period of analysis.

Movement Rates (<1MGD)

Separation rates:

A = .14
B = .08
C = .12
D = .05

Fill Supv. A

Supv. B	.70
Opr. A	.20
Opr. B	.10

Fill Supv. B

Supv. C	.60
Opr. B	.10
Opr. C	.30

Fill Supv. C

Opr. C	.40
Opr. D	.10
Supv. D	.10
N.H. (New Hire)	.40

Fill Supv. D

Opr. D	.50
N.H.	.50

Fill Opr. A

Opr. B	100%

Fill Opr. B

Opr. C	.70
Opr. D	.20
N.H.	.10

Fill Opr. C

Opr. D	.30
N.H.	.70

Fill Opr. D

N.H.	100%

Fill Lab A

No accessions needed due to the fact that there are no people employed in this certificate grade and there are no personnel entering during the five year period due to plant expansions or transfers in.

Fill Lab B

Lab C	.70
Lab D	.20
N.H.	.10

Fill Lab C

Lab D	.30
N.H.	.70

Fill Lab D

N.H.	100%

Fill Maint. A

No accessions needed due to the fact that there are no people employed in this certificate grade and there are no personnel entering during the five year period due to plant expansions or transfers in.

Fill Maint. B

Maint. C	100%

Fill Maint. C

Maint. D	.20
N.H.	.80

Fill Maint. D

N.H.	100%

Movement Rates (≥1MGD)

Separation rates:

A = .06
B = .04
C = .10
D = .17

Transfer and new hire rates (accession rates):

Fill Supv. A

Supv. B	.40
Opr. A	.20
Opr. B	.40

Fill Supv. B

Supv. C	.30
Opr. B	.40
Opr. C	.30

Fill Supv. C

Opr. C	.40
Opr. D	.10
Supv. D	.10
N.H.	.40

Fill Supv. D

Opr. D	.50
N.H.	.50

Fill Opr. A

Opr. B	100%

Fill Opr. B

Opr. C	.70
Opr. D	.20
N.H.	.10

Fill Opr. C

Opr. D	.30
N.H.	.70

Fill Opr. D

N.H.	100%

Fill Lab A

Lab B	100%

Fill Lab B

Lab C	.70
Lab D	.20
N.H.	.10

Fill Lab C

Lab D	.30
N.H.	.70

Fill Lab D

N.H.	100%

Maint. A

Maint. B	100%

Maint. B

Maint. C	.70
Maint. D	.20
N.H.	.10

Maint. C

Maint. D	.30
N.H.	.70

Maint. D

N.H.	100%

TAB B

EXHIBIT 5 - TRAINING CALCULATIONS

TRAINING CALCULATIONS

Entry Level Training:

The number of personnel in need of entry level training equals the number of new hires. (Number of new hires is displayed on informational output charts and manpower transition analysis worksheets.) The number of entry level student hours required for each grade of each occupation is calculated by using the following procedure. The number entering into each particular grade is multiplied by the hourly requirements for that grade as established by the Texas Department of Health Resources. The following calculations pertain to the training needs of the first year (January, 1976 - January, 1977) of the five year analysis period. (The average of the maximum and minimum hours required was used due to the inability to determine the experience, education, and training levels of the new hires. See Texas Department of Health Resources certification rules and regulations, "Certification of Water Utilities Operators". TAB B, Exhibit 3-3.)

Calculations (<1MGD):

Supv. C

30 (average hr. requirement for C) X

29 (number of new hires = 870 student hours

Supv. D

15 (average hr. requirement for D) X

7 (Number of new hires) = 105 student hours

Opr. B

80 (average hr. requirement for B) X

1 (number of new hires) = 80 student hours

Opr. C

30 (average hour requirements for C) X

48 (number of new shires) = 1440 student hours

Opr. D

15 (average hour requirements for D) X

45 (number of new hires) = 675 student hours

This process is continued for each grade within each occupation. This same process is also applied to the ≥1MGD flow group. When the calculations are complete for both flow groups for the year January, 1976 - January, 1977, the procedure is applied to the other four years of the analysis period. Completed calculations of training hours required are entered into the appropriate column on the informational output chart for the corresponding time period and flow group.

Update Level Training:

The number in need of update or renewal training equals the number of people who remained in the same certificate grade from the beginning to the end of the analysis period. (Number of personnel remaining in same certificate grade is displayed on informational output charts and manpower transition analysis worksheets.) Personnel transferring from one occupation to another but with no accompanying change in certificate grade, such as A operators transferring to the A supervisor category, require update certification training, not upgrade training. The number of update student hours required is computed by using the following procedure. The duration of each certificate grade is used to determine the number of certificates which will expire in each of the five years. The number of certificates expiring in each year is multiplied by the hourly update requirements to determine the number of update hours required for each certificate grade within each occupation. (See Texas Department of Health Resources rules and regulations, "Certification of Water Utilities Operators", TAB B, Exhibit 3-3.) A formula has been developed for determining the number of certificates which will expire in each of the five years. This formula accounts for update training required by personnel who remain in the same position, as well as update training required by new hires and upgraded personnel. The formula is:

$$\frac{\text{average employment* - (upgrades + separations)}}{\text{duration of certificate}}\text{(Class hours)} = \begin{array}{l}\text{update}\\ \text{hrs. per}\\ \text{year}\end{array}$$

*average employment = current + projected ÷ 2

(This formula assumes that there will be an equitable distribution of update training over the five year period.)

Some difficulty was encountered in figuring update training for the first year of the five year analysis period (January, 1976 - January, 1977) due to the large number of personnel with expired certificates. Update training hours for these personnel were calculated on the assumption that approximately one-half of such personnel would attend training courses prior to retaking the certification exams. (According to certification regulations, a person can renew an expired certificate only by retaking the certification exam.) The number of personnel with expired certificates was multiplied by the hourly update requirements for each particular certificate grade. (See "Certification of Water Utilities Operators", TAB B, Exhibit 3-3). These hourly update requirements approximate the number of student hours that would be needed if one-half of the personnel with expired certificates attended training courses prior to retaking the exams. It was assumed that all of the expired certificates would be renewed in the first year of the five-year analysis period. This assumption will generate heavy training loads during the first year.

To avoid counting the same personnel twice, the number of personnel with expired certificates was subtracted from the current employment for the first year (January, 1976 - January, 1977). The previously mentioned formula was then applied to the resulting employment totals. Once completed, the update training required by personnel with active certificates was added to the update or renewal training required by personnel with expired certificates. This sum equals the total update training required during the year (January, 1976 - January, 1977). Update training calculations for this year were completed in the following manner:

Calculations (<1MGD):

Supv. A

No update training required due to fact that A certificates are perpetual.

Supv. B

Expired: 31(no. of personnel) X 50 (hourly update requirement for B) = 1550 student hours

Active: 165(current) - 31(expired) = 134 (current adjusted)

134 + 168(projected) ÷ 2 = 151 (average employment)

$$\frac{151 - (1 \text{ upgrade} + 13 \text{ separations})}{5 \text{ years (duration of B certificate)}} (\ 50\ ) = 1370 \text{ student hours}$$

1550 (student hrs. required by personnel with expired certificates)
+1370 (student hrs. required by personnel with active certificates)
2920 Total student hours required by Supervisor B

Supv. C

Expired: 116(no. of personnel) X 20(hourly update requirement for C = 2320 student hours

Active: 461(current) - 116(expired) = 345 (current adjusted)

345 + 468(projected) ÷ 2 = 407 (average employment)

$$\frac{407 - (10 \text{ upgrades} + 55 \text{ separations})}{3 \text{ years (duration of C certificates)}}(20) = 2280$$

2320 (student hours required by personnel with expired certificates)
+2280 (student hours required by personnel with active certificates)
4600 Total student hours required by Supervisor C

Supv. D

Expired: 31(no. of personnel) X 10 (hourly update requirement for D) = 310 student hours

Active: 108(current)- 31(expired) = 77 (current adjusted)

77 + 110(projected) ÷ 2 = 94 (average employment)

$$\frac{94 - (7 \text{ upgrades} + 5 \text{ separations})}{2 \text{ years (duration of D certificates)}}(10) = 410$$

310 (student hours required by personnel with expired certificates)
410 (student hours required by personnel with active certificates)
720 Total student hours required by Supervisor D

This process is continued for each grade within each occupation. This same process is also applied to the ≥1MGD flow group. When the calculations are completed for both flow groups for the year January, 1976 - January 1977, the procedure is applied to the other four years of the analysis period. (Since all expired certificates were assumed to be renewed in the first year, only the formula need be applied to the remaining four years in order to obtain update training totals.) Completed calculations of training hours required are entered into the appropriate column on the informational output chart for the corresponding time period and flow group.

Upgrade Level Training:

The number in need of upgrade certification training equals the number of personnel transferring into a higher grade of certification. (Number of workers upgrading is displayed on informational output charts and manpower transition analysis worksheets.) The number of upgrade student hours required for each grade of each occupation is calculated by using the following procedure. The number transferring from a lower certificate grade to a higher certificate grade is multiplied by the net increase in hours required for the acquisition of the higher grade certificate. It should be noted that all certification progressions are not sequential, such as certified workers who move directly from the D level to the B level of certification. (The average of the maximum and minimum hours required was used due to the inability to determine the experience, education, and training levels of workers upgrading to a higher level of certification. See Texas Department of Health Resources certification rules and regulations, "Certification of Water Utilities Operators", TAB B, Exhibit 3-3.) The following calculations pertain to the training needs of the first year (January, 1976 - January, 1977) of the five year analysis period.

Calculations (<1MGD):

Fill Supv. A

Supv. B 1 person

Opr. A No upgrade certification training required.

Take the average training requirement for grade B which is 80 hours and subtract this from the hour requirement for grade A.

160 average hour requirement for grade A
-80 average hour requirement for grade B
= 80 additional hours required for each B grade worker upgrading to an A certificate grade

multiply the additional hours required by the number of personnel transferring in from grade B and this equals the upgrade student hours required for the Supervisor A job category

80 (number of additional hours required) X
1 (number of personnel transferring) = 80 = number of upgrade student hours required for the Supervisor A job category

Fill Supv. B

Supv. C 10 people
Opr. B No upgrade certification training required.
Opr. C 5 people

Take average training requirement for grade C which is 30 hours and subtract this from the hour requirement for grade B.

80 average hour requirement for grade B
-30 average hour requirement for grade C
= 50 additional hours required for each C grade worker upgrading to a B certificate grade

multiply the additional hours required by the number of personnel transferring in from grade C and this equals the upgrade student hours required for the Supervisor B job category

50 (number of additional hours required) X
15 (number of personnel transferring) = 750 = number of upgrade student hours required for the Supervisor B job category

Fill Supv. C

Supv. D 7 people
Opr. C No upgrade certification training required.
Opr. D 7 people

Take average training requirements for grade D which is 15 hours and subtract this from the hour requirement for grade C.

30 average hour requirement for grade C
-15 average hour requirement for grade D
= 15 additional hours required for each D grade worker upgrading to a C certificate

multiply the additional hours required by the number of personnel transferring in from grade D and this equals the upgrade student hours required for the Supervisor C job category

15 (number of additional hours required) X 14 (number of personnel transferring) = 210 = number of upgrade student hours required for the Supervisor C job category

Supv. D

No upgrade training required due to fact that D is the lowest certificate grade and there are no personnel transferring into the D certificate grade.

This process is continued for each grade within each occupation. This same process is also applied to the ≥1MGD flow group. When the calculations are complete for both flow groups for the year January, 1976 - January, 1977 the procedure is applied to the other four years of the analysis period. Completed calculations of training hours required are entered into the appropriate column on the informational output chart for the corresponding time period and flow group.

Summary:

It should be emphasized that the total student hours required are for the four major occupations within the certified municipal workforce only. This total does not include training loads generated by certified personnel within the other three wastewater system categories (other public service organization, industry, and federal entity), nor does it include training needed by the non-certified personnel within all four system categories. Also, the training loads are calculated on the basis of minimum student hours needed to comply with the certification regulations. It is quite probable that in many cases individuals acquire student hours in excess of the minimum certification requirements.

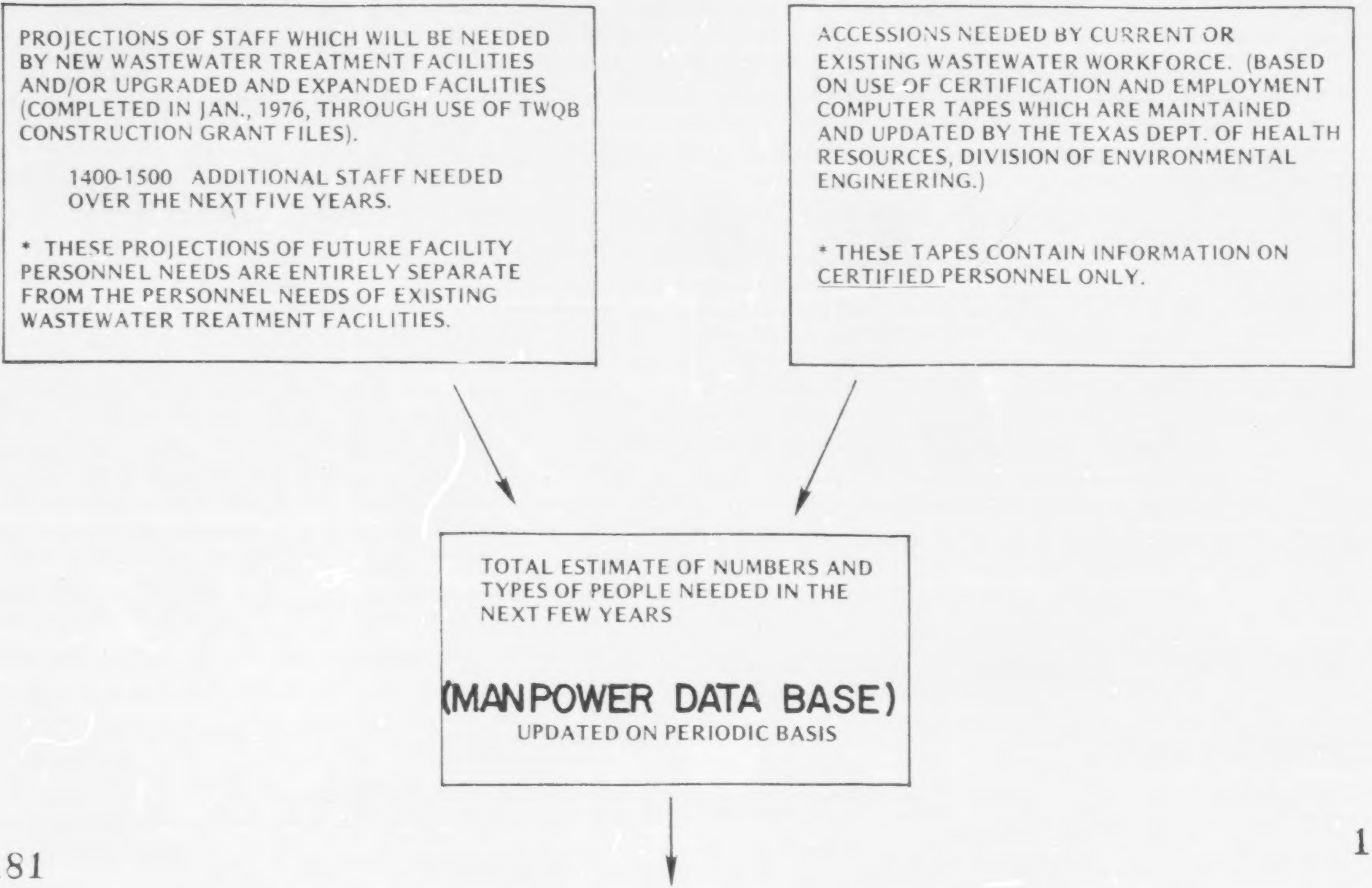
A task which will need to be completed in future months is the projection of the types of courses that should be provided to each grade within each occupation. By completing this task, the total number of training hours required (entry, update, or upgrade) can be identified with the specific type of training program in which the hours will be acquired.

The current Texas Department of Health Resources regulations require only that the specified number of student hours or training credits be acquired for each certificate grade. There are no specific course requirements for the certificate grades, whether the training is to be applied towards the updating, upgrading, or initial acquisition of a certificate. The only requirement is that the student hours must have been obtained in a training program related to wastewater. Student hours or training credits are acquired at the rate of one credit per class hour of completed courses. Training credits also can be obtained for completion of college courses in chemistry or biology. (Another method of obtaining training credits is attendance at district meetings of the Texas Water Utilities Association. See "Certification of Water Utilities Operators", TAB B, Exhibit 3-3.) Most of the wastewater training courses in the State of Texas are provided by the Engineering Extension Service of Texas A&M University. This training is provided either at area short schools or regional or annual short schools by the itinerant instructors of the Engineering Extension Service staff. Most of these training courses provide 20 hours of classroom instruction.

TAB B

EXHIBIT 6 - MANPOWER DATA BASE FLOW CHARTS

MANPOWER DATA BASE



PROJECTIONS OF STAFF WHICH WILL BE NEEDED BY NEW WASTEWATER TREATMENT FACILITIES AND/OR UPGRADED AND EXPANDED FACILITIES (COMPLETED IN JAN., 1976, THROUGH USE OF TWQB CONSTRUCTION GRANT FILES).

1400-1500 ADDITIONAL STAFF NEEDED OVER THE NEXT FIVE YEARS.

* THESE PROJECTIONS OF FUTURE FACILITY PERSONNEL NEEDS ARE ENTIRELY SEPARATE FROM THE PERSONNEL NEEDS OF EXISTING WASTEWATER TREATMENT FACILITIES.

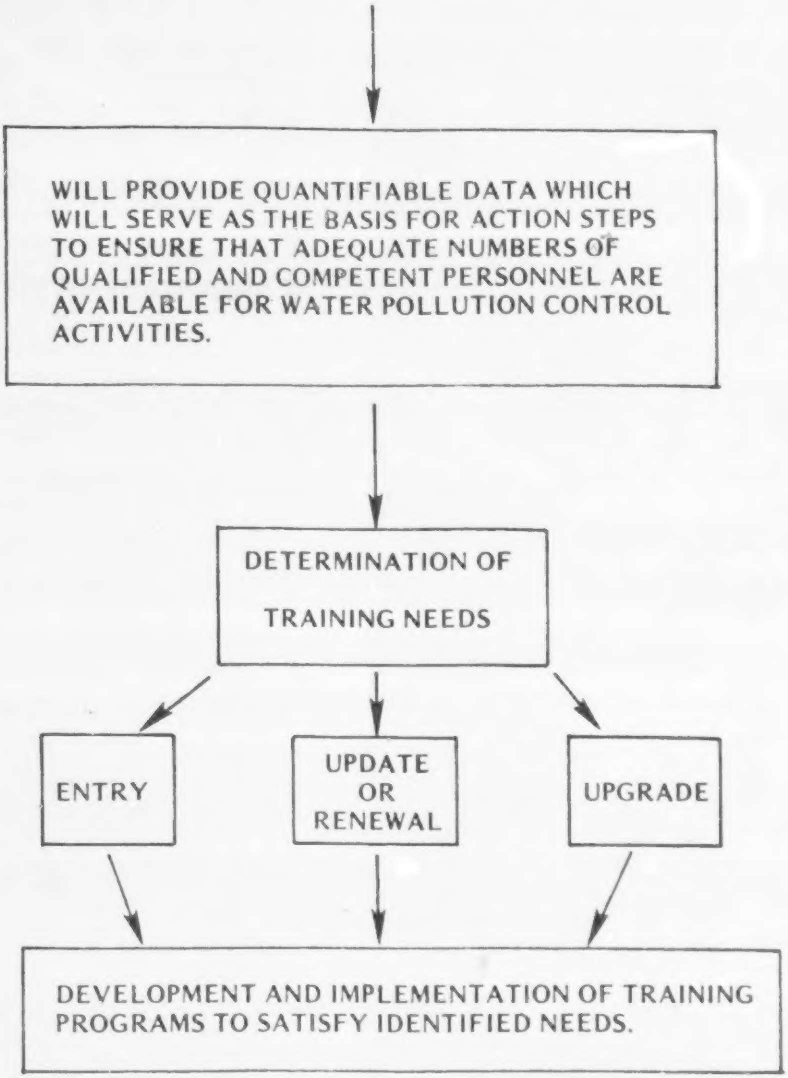
ACCESSIONS NEEDED BY CURRENT OR EXISTING WASTEWATER WORKFORCE. (BASED ON USE OF CERTIFICATION AND EMPLOYMENT COMPUTER TAPES WHICH ARE MAINTAINED AND UPDATED BY THE TEXAS DEPT. OF HEALTH RESOURCES, DIVISION OF ENVIRONMENTAL ENGINEERING.)

* THESE TAPES CONTAIN INFORMATION ON CERTIFIED PERSONNEL ONLY.

TOTAL ESTIMATE OF NUMBERS AND TYPES OF PEOPLE NEEDED IN THE NEXT FEW YEARS

(MANPOWER DATA BASE)

UPDATED ON PERIODIC BASIS



WILL PROVIDE QUANTIFIABLE DATA WHICH WILL SERVE AS THE BASIS FOR ACTION STEPS TO ENSURE THAT ADEQUATE NUMBERS OF QUALIFIED AND COMPETENT PERSONNEL ARE AVAILABLE FOR WATER POLLUTION CONTROL ACTIVITIES.

DETERMINATION OF TRAINING NEEDS

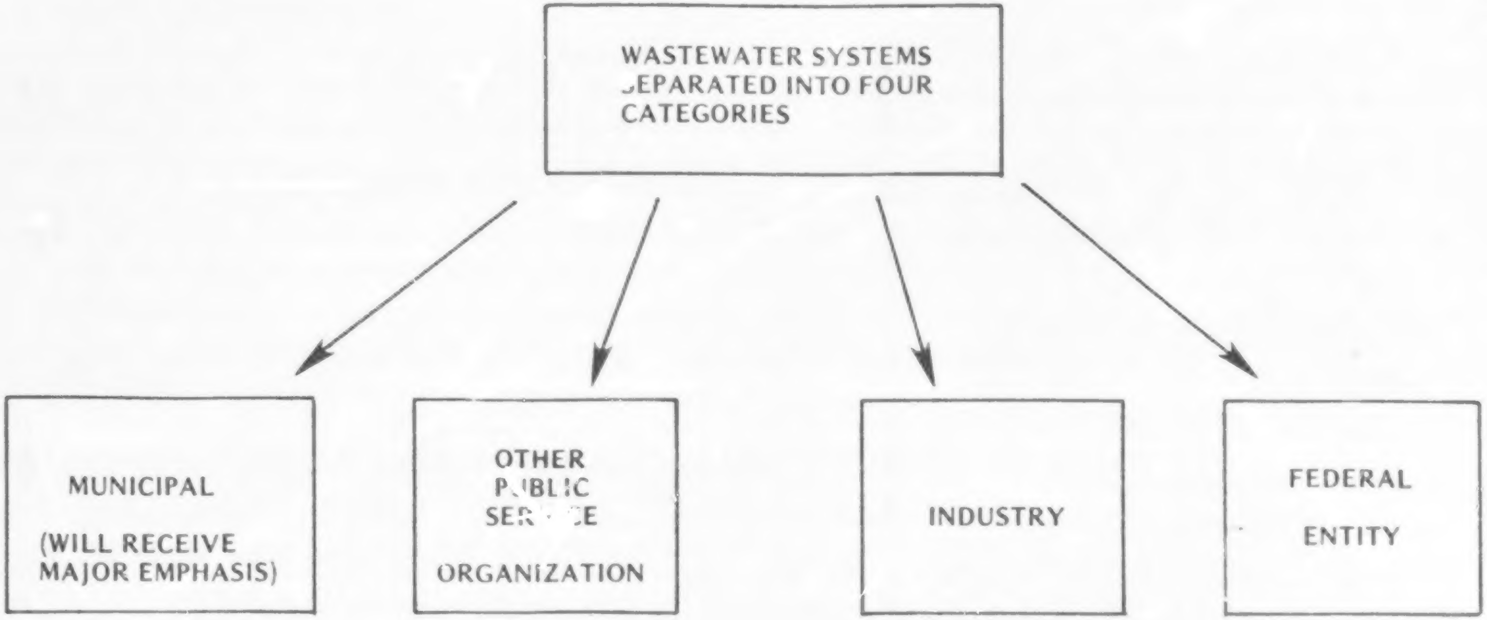
ENTRY

UPDATE OR RENEWAL

UPGRADE

DEVELOPMENT AND IMPLEMENTATION OF TRAINING PROGRAMS TO SATISFY IDENTIFIED NEEDS.

EXAMINATION OF CURRENT WASTEWATER WORKFORCE



WASTEWATER SYSTEMS SEPARATED INTO FOUR CATEGORIES

MUNICIPAL

(WILL RECEIVE MAJOR EMPHASIS)

OTHER PUBLIC SERVICE ORGANIZATION

INDUSTRY

FEDERAL ENTITY

SYSTEMS WITHIN EACH OF THE FOUR CATEGORIES SEPARATED INTO TWO GROUPS ACCORDING TO AVERAGE FLOW IN MILLION GALLONS/DAY: (MGD):

1. THOSE WITH FLOWS OF IMGD OR MORE
2. THOSE WITH FLOWS OF LESS THAN IMGD

FOR THE PERSONNEL WITHIN EACH OF THE TWO FLOW GROUPS FOR EACH OF THE FOUR SYSTEM CATEGORIES, THE FOLLOWING THINGS WILL BE CALCULATED: (SEE PAGE 5)

I. NUMBER OF PERSONNEL IN EACH OCCUPATION.

THE WASTEWATER POSITION CODES USED BY THE TEXAS DEPT. OF HEALTH RESOURCES HAVE BEEN GROUPED INTO 4 MAJOR OCCUPATIONS FOR OUR PURPOSES:

1. SUPERVISOR
2. OPERATOR
3. LAB TECHNICIAN
4. MAINTENANCE PERSONNEL

FOR EACH OCCUPATION THERE WILL BE A BREAKDOWN FOR THE NUMBER EMPLOYED IN EACH CERTIFICATION GRADE:

GROUPING OF TDHR WASTEWATER POSITION CODES

SUPERVISOR

30 - DIRECTOR OF UTILITIES

60 (34) - WASTEWATER SUPERINTENDENT

62 (35) - WASTEWATER PLANT SUPERINTENDENT

70 (40) - ASSISTANT WASTEWATER SUPERINTENDENT

OPERATOR

63 (36) - WASTEWATER PLANT OPERATOR

64 (39) - LIFT STATION OPERATOR

68 - INDUSTRIAL WASTE OPERATOR

LAB

31 - CHEMIST

32 - BIOLOGIST

33 - LABORATORY TECHNICIAN

67 - WATER QUALITY ANALYST

MAINTENANCE

66 - INSTRUMENT TECHNICIAN

69 (38) - MAINTENANCE

ALSO SEPARATE LISTINGS FOR:
65 (41) - COLLECTION SYSTEM SERVICEMAN
97 - RETIRED
98 - UNEMPLOYED
99 - HAS WASTEWATER CERTIFICATE BUT NOT EMPLOYED IN THE WASTEWATER PROFESSION

EXAMPLE:

OPERATOR				
TOTAL	A	B	C	D
20	5	5	5	5

II. NUMBER OF PEOPLE WORKING IN WATER SYSTEMS WHO HAVE A WASTEWATER CERTIFICATE.

III. NUMBER OF PEOPLE WHO HAVE WASTEWATER POSITIONS BUT WHO DO NOT HAVE A WASTEWATER CERTIFICATE. (THESE ARE THE PEOPLE WHO HAVE WATER CERTIFICATES.)

IV. NUMBER OF PEOPLE WHO ARE RETIRED.

V. NUMBER OF PEOPLE WHO ARE UNEMPLOYED.

VI. NUMBER OF CERTIFIED PEOPLE WHO ARE EMPLOYED OUTSIDE OF THE WASTEWATER PROFESSION.

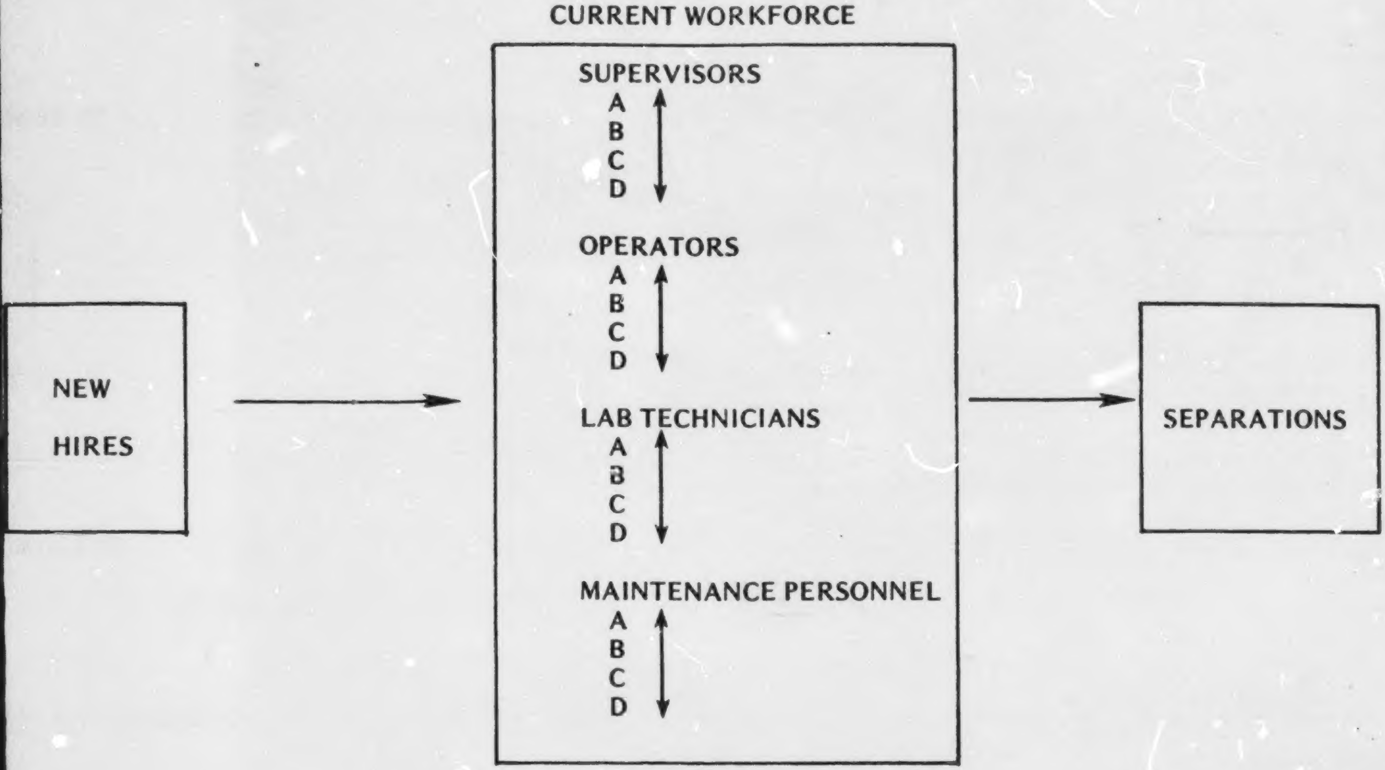
VII. OTHER EMPLOYMENT CHARACTERISTICS WHICH WILL BE DISPLAYED USING AN AGE-BRACKET BASIS.

	AVG. YRS. OF EDUCATION	AVG. HOURS OF TRAINING	AVG. YEARS OF EXPERIENCE	AVG. YRS. AT ONE SYSTEM	AVG. YRS. AT PRESENT DUTY
UNDER 21					
21-25					
26-30					
↓					
51-55					
OVER 55					

* FOR ALL OF THE ABOVE EMPLOYMENT CHARACTERISTICS (I, II, III, IV, V, AND VI) DATA WILL BE CALCULATED FOR EACH OF THE CERTIFICATION GRADES WITHIN EACH OF THE OCCUPATIONS; DATA WILL BE DISPLAYED FOR THE STATE AS A WHOLE AS WELL AS FOR EACH TWQB DISTRICT.

EXAMINATION OF MANPOWER MOVEMENTS WITHIN CURRENT WORKFORCE

CONSTRUCTION OF MANPOWER PIPELINE THROUGH USE OF COMPUTER MATRICES WHICH WILL SHOW MOVEMENTS INTO, THROUGH, AND OUT OF THE WORKFORCE:
(FROM GRADE TO GRADE AND FROM OCCUPATION TO OCCUPATION)



CURRENT WORKFORCE

NEW HIRES

SUPERVISORS
A
B
C
D

OPERATORS
A
B
C
D

LAB TECHNICIANS
A
B
C
D

MAINTENANCE PERSONNEL
A
B
C
D

SEPARATIONS

MANPOWER PIPELINE WILL:

1. DISPLAY MOVEMENTS FOR STATE AS A WHOLE.
2. DISPLAY MOVEMENTS WITHIN EACH TWQB DISTRICT.
3. DISPLAY MOVEMENTS BETWEEN TWQB DISTRICTS.
4. PROVIDE THE NUMBER OF LOSSES AND REPLACEMENTS FOR EACH CERTIFICATION GRADE WITHIN EACH OCCUPATION.

TOTAL NUMBER OF LOSSES AND REPLACEMENTS CAN BE FIGURED BY USING THE FOLLOWING PROCEDURES:

EXPANSIONS + SEPARATIONS + TRANSFERS OUT = ACCESSIONS NEEDED

NEW HIRES + TRANSFERS IN = ACCESSIONS

TAB C

"MANPOWER PLANNING FOR THE WASTEWATER TREATMENT WORKFORCE OF TEXAS: AN EMERGING FUNCTION"

MANPOWER PLANNING FOR THE WASTEWATER TREATMENT WORKFORCE OF TEXAS: AN EMERGING FUNCTION

By

TOM JACKSON

And

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Tom Jackson and Bobby D. Whitefield are, respectively, Manpower Planner and Chief of the Education and Training Section, Texas Water Quality Board, Austin, Texas. This paper was presented at the 58th Annual meeting of the Texas Water Utilities Association, College Station, Texas, March, 1976 by Mr. Jackson. This paper recently was submitted for publication in the Southwest Water Works Journal.

MANPOWER PLANNING FOR THE WASTEWATER TREATMENT WORKFORCE OF TEXAS: AN EMERGING FUNCTION

In recent years, the protection of our water resources has received increased emphasis from both public and private sectors of our society. Accompanying this growing concern for the use and quality of water has been the emergence of many new programs and functions aimed at more effective water pollution control. One of the most recent of these innovations is environmental manpower planning, and the Texas Water Quality Board is making considerable progress in this important field. This paper reviews the progress so far and presents an analysis and description of what remains to be accomplished.

The Texas Water Quality Board recognizes the importance of the quality and use of human resources to the attainment of its environmental objectives. The Texas Water Quality Board's Environmental Education and Training Section maintains a full-time manpower planner for the purpose of identifying and defining the needs of the wastewater treatment workforce of Texas. Top management of the U. S. Environmental Protection Agency also has become increasingly aware of the importance of ensuring that qualified manpower is available for environmental protection activities. It is the desire of the Texas Water Quality Board that the cooperative relationship which exists between the Board and the Environmental Protection Agency concerning manpower planning be fostered and further developed. The objective of this relationship aims toward helping local units of government meet their particular manpower needs for effective wastewater treatment as required by state and federal statutes.

Recent federal legislation dealing with water pollution control has been very strict. P.L. 92-500 contains many comprehensive plans for improving the quality of water across the nation and billions of dollars are being granted to municipalities for the construction of new and more efficient wastewater treatment plants capable of producing high quality effluents. Accompanying this increased number of new and more efficient facilities must come the realization that adequate numbers of properly trained and qualified personnel are essential to operate and maintain these expensive facilities in a cost-effective manner. Incompetent and/or inadequate manpower will soon render the best treatment plant ineffective.

The ultimate manpower planning goal at the Texas Water Quality Board is to ensure that the wastewater utilities plant organization has the right number of the right type of people at the right times and at the right places doing things for which they are most useful.[1] Included in this process must be a concerted effort at the municipal level to ensure that each employee has the opportunity to continually develop and fully utilize his capabilities, has proper working conditions, and be properly rewarded for his efforts. This is an ambitious undertaking, but we firmly believe that it is a necessary activity towards ensuring that qualified and adequate manpower is available for those water pollution control activities mandated by law.

The first step in this manpower planning process consists of a comprehensive needs assessment of the numbers and types of staff needed by both existing and future wastewater treatment facilities. The collection of such information will serve as a basis for the development and maintenance of an ongoing, computer-housed manpower data base for the municipal wastewater treatment workforce of Texas. Hopefully, the information collected and analyzed for the municipal workforce will serve as the basis for expanding into the private sector. Once completed, this municipal manpower data base will provide the critical and quantifiable data necessary for the formulation and implementation of action plans needed to alleviate state manpower problems.

The manpower planning staff of the Texas Water Quality Board's Education and Training Section is making considerable progress toward establishment of the above mentioned manpower data base. Recently a system was developed for forecasting manpower which will be needed due to the construction of new plants and/or the upgrading and expansion of existing plants. It has been determined that by 1980, approximately 1400-1500 new jobs will be created by these new or expanded wastewater treatment facilities. In addition to increasing the demand for operators and other wastewater treatment personnel, this figure also indicates that a substantial increase in training funds will be needed. A recent Environmental Protection Agency study estimated the cost of training a single operator averaged $565.00.[2] This means that over the next five years, at least $800,000 will be needed to ensure that the 1400-1500 future positions mentioned above are filled by competent and adequately trained personnel. It should be noted that this estimate of training costs is entirely separate from the funds which will be needed to provide renewal, upgrade, and entry level training for the existing or current wastewater workforce in Texas.

The above staffing projections were obtained through extensive use of the construction grant files of the Texas Water Quality Board.

Numerous discussions with the staff of the Board's Construction Grant Section and careful examination of the various documents in the construction grant files, indicated that the facility plans offered the best staffing information available. The facility plan is a comprehensive study of the possible waste management alternatives for a proposed construction project. The purpose of the facility planning effort is to select that alternative which is the most cost-effective and environmentally sound. Facility plans are most valuable for manpower planning purposes in that they provide staffing projections at such an early stage in the construction grant process. Each project receiving grant monies is required by law to submit a facility plan at the end of step 1 of the construction grant process. This makes staffing projections available 2 to 5 years before the plant comes into full operation, depending upon the complexity of the project. The remaining two steps in the construction grant process include the preparation of plans and specifications and actual facility construction. Operation and maintenance manuals also contain staffing information, however, the information is of negligible value in making long-range projections because these manuals generally are not submitted until facility construction is between 50 and 90% complete.

The research procedure followed in examining the facility plans consisted of the following steps. A current list of approved facility plans was obtained from the Board's engineers in the Construction Grant Section. Each project file containing an approved facility plan was examined and the appropriate staffing information recorded on a staffing projection worksheet. Sixty-eight facility plans which involved the construction of a new plant and/or the upgrading and expansion of an existing plant were researched. Projects which involved the construction of interceptors, collection systems, outfall lines, or lift stations were not included due to the negligible amount of additional manpower needed to operate and maintain most of these types of improvements. Out of the total of 87 current and approved facility plans, only 19 or 22% were of this type.

For each of the 68 facility plans which was researched, an attempt was made to record staffing projections in four basic categories or occupations: operators with a breakdown for each grade (A, B, C, D), supervisors, maintenance personnel, and laboratory technicians. However, most of the facility plans listed total personnel needed rather than a specific number for each occupation. These total personnel requirements are probably sufficient for projection purposes due to the fact that over one-half of the 68 plans were for projects with design flows of less than 1 million gallons per day (MGD). The workload at these plants with small capacities is usually shared rather equally by all of the employees and thus a breakdown of manpower projections into specific occupations is not necessary.

Also obtained from the facility plans was information concerning the type of treatment for each new plant or plant expansion. Of prime concern here was the acquisition of data which would enable the manpower planner to gain some idea of the number of staff needed specifically by newly constructed and/or expanded advanced wastewater treatment facilities. Out of the 68 plans which were researched, 21 or 31% were for projects involving advanced wastewater treatment. In addition, the existing flow, design flow, design population of the area to be served, and projected date of completion was recorded for each project. This information was compiled and displayed on summary report forms in such a way as to indicate separately the manpower needed by new plants, upgraded or expanded plants, and advanced treatment plants. On all the report forms, the data is identified with its corresponding Texas Water Quality Board district in an effort to make the projections more meaningful.

The 68 facility plans which were examined served as the basis for estimating the 1400-1500 new jobs which will be created by the 444 total construction projects listed on the Texas Water Quality Board computer print-out entitled "Construction Grant Priority Ranking Process". Of the 444 total projects, 340 involve the construction of a new plant and/or the upgrading and expansion of an existing plant. The remaining 104 are projects dealing with collection systems, interceptors, outfall lines, or lift stations. As described earlier, these 104 projects were not included in the staffing projections process due to the negligible amount of additional personnel needed to operate and maintain most of these types of improvements. These 104 projects comprise 23% of the 444 total projects. It is interesting to note that this percentage is almost the same as the 22% figure obtained for the number of similar projects which were part of the total of 87 current and approved facility plans.

Manpower projections for the 340 projects were completed by applying statistical procedures to the data obtained from the 68 facility plans. In an effort to obtain more accurate projections, the 68 facility plans were separated into two groups according to design flow in million gallons per day (MGD), those 1/MGD or above and those below 1/MGD. It was determined that of the 340 projects, 156 were for projects with design capacities of 1/MGD or more and 184 were for projects with design capacities of less than 1/MGD.

Initially, an attempt was made to project staffing needs by using the 68 facility plans as a whole. However, after careful examination of the extreme differences in design flow and staff requirements among the 68 plans, it was decided to separate the plans into two groups. It was determined that approximately 1300 of the 1400-1500 new jobs will be created by those facilities with design capacities of 1/MGD or above.

Manpower projections for advanced wastewater treatment plants were also completed. Using statistical procedures similar to those involved in the above calculations, it was estimated that of the 340 projects involving new plants and/or plant expansions or improvements, 105 are projects involving advanced wastewater treatment. It was projected that the number of new jobs that will be created by these advanced wastewater construction projects will be in the range of 700-1000. It is interesting to note that the lowest of these two ranges comprise approximately one-half of the total of 1400-1500 jobs that will be created by the 340 construction projects involving new plants and/or plant expansions or improvements in the next five years. Due to the specialized and complex nature of training required for the operation and maintenance of advanced wastewater treatment facilities, it is quite possible that the cost of training personnel for the 1400-1500 future positions will be higher than the previously mentioned $800,000.

The high degree of uncertainty over continued funding of each project makes it difficult to obtain precise figures, but the data obtained in this study represents a reasonably accurate estimate of the manpower which will be needed by new or expanding wastewater treatment facilities in the next few years. It should be noted that the accuracy of these figures is dependent upon the researcher's assumption that the 68 facility plans which were researched (a 20% sample) are representative of the total number of 340 projects. At the time the research was conducted, these 68 plans represented the total number of current and approved facility plans involving new plants and/or plant expansions or improvements.

In order to keep this projection system up-to-date it will be necessary to periodically examine future facility plans as they are approved and certified by Texas Water Quality Board staff. As more facility plans are submitted and approved in future months, the reliability of the data base for making projections will improve. It will also be necessary to periodically check with the Texas Water Quality Board engineers responsible for final inspections to determine which plants have been completed and are "on line". The number of staff at these completed projects will then be subtracted from the total projected staff needed. Based on careful research of the variety of documents in the construction grant files, it is the judgment of the Board's manpower planning staff that this system of using facility plans to make staffing projections provides tangible manpower data at the earliest possible date. The completion of the facility plan represents the first stage in the construction grant process in which the municipality is required to devote serious consideration to the proper staffing complement needed to operate and maintain the completed facility. Attempts at projecting staffing needs at an earlier time, without the aid of documented needs assessments by the municipalities involved, would most likely result in mere speculation.

The second part of the manpower data base will consist of an examination of the existing municipal wastewater treatment workforce. Information collected and analyzed here will be used with the previous staffing projections discussed above to determine a total estimate of the numbers and types of personnel needed in the next few years by both existing and future wastewater treatment facilities. Like the staffing projection system, data on the existing workforce will be updated periodically in an effort to provide relevant and accurate information. Present plans are for the staffing projection system and data on the existing workforce to be computer-housed, thus providing a truly usable manpower data base capable of responding promptly to requests for quantifiable data.

The first step in the examination of the existing workforce will be to determine the total number of people employed in each occupation with a breakdown for each certification grade (A, B, C, D). Information on the numbers and types of personnel will be grouped into four major occupational categories: operators, supervisors, maintenance personnel, and laboratory technicians. Other data collected will consist of an analysis of the manpower movements into, through, and out of the existing workforce. Initially, a one-year time period will serve as the basis for making these determinations. For each of the above occupations, data will be collected on the number of separations, number of transfers, number of new hires, and recommended employment levels. Separations consist of the number of people leaving the workforce due to resignation, retirement, dismissal, or some other reason. New hires include those persons from the outside labor force entering the wastewater treatment workforce with no prior experience. Recommended employment levels are those staffing levels which are recommended but not required. In many cases actual employment levels are below recommended levels, thus creating problems related to understaffing. Transfers are of two types, those out of an occupation and those into an occupation. Each of the occupations will gain some personnel due to transfers in from the other occupations, but will also lose some people due to transfers out. All of the manpower movements into, through, and out of the existing workforce will be displayed in diagrammatic form through use of an instrument called a manpower pipeline. As with the staffing projection system, manpower movements will be broken down into Texas Water Quality Board districts in an effort to make the data more meaningful.

Upon completion of the initial examination of the existing workforce, a total estimate of the numbers and types of staff needed by both existing and future wastewater treatment facilities can be determined. This will be done by first adding the number of separations and net transfers out occurring in each occupation during the initial one-year time period to obtain an estimate for the number of replacements needed by the existing workforce. These figures will then be used with the staffing projections for future facilities to determine a total need. Like the staffing projection system, update analyses of the existing workforce will be needed at appropriate intervals in order to provide the information necessary for estimating staffing needs further into the future.

Once developed, the manpower data base should serve as the basis for the formulation of action plans. With knowledge of numbers and types of personnel needed, recruiting and training programs can be formulated. By figuring the certificate expiration dates for existing certified personnel in each of the four occupational categories, an estimate can be obtained as to update or renewal training that will be needed in the next few years. Also, the number of new hires and number of transfers to a higher position will provide information on entry and upgrade training needed. Determination of needs first is not only the most valid method for developing training plans and action steps, it is also the most cost-effective. Each year, many tax dollars which are spent on wastewater-related manpower programs fall short of achieving the maximum benefit possible because the real problem or need was not clearly identified before action was initiated.

A substantial part of the manpower and training needs discussed in this paper can be met through established educational institutions. The two year vocational institute and the community college have the potential to perform a particularly important function in supplying large numbers of well-trained, technical personnel. Existing training organizations which provide various types of short courses for wastewater personnel also will have a key role in ensuring that adequate numbers of properly trained and qualified personnel are available for water pollution control activities. Many of the activities of these training organizations will need to be refined and expanded to meet the growing demands for large quantities of training programs of a specialized nature. More short courses will need to be provided which offer training that is directly related to the actual work performed. It is quite possible that additional training programs will need to be designed and implemented to satisfy those demands which cannot be met through existing educational institutions and training organizations.

Another approach towards the satisfaction of identified manpower and training needs is the use of available federal funds. The Comprehensive Employment and Training Act (CETA) contains provisions for the use of federal monies to train and employ people who are in lower income brackets as a result of being unemployed or underemployed. These CETA funds can be used to train and employ eligible people in various water pollution control occupations. Communication and cooperation with the prime sponsors and other members of the State Manpower Services Council of Texas could result in the acquisition of CETA funds as well as other federal monies for use in meeting manpower and training needs. The prime sponsors of the Manpower Services Council represent various regions of the state and are knowledgeable of the various types of manpower programs that are operating in their areas. Individuals or organizations interested in federal manpower programs should contact the prime sponsor in their area for assistance.

There is evidence on the local level of the beginning of an increased awareness of the importance of manpower planning to successful water pollution control. Persons interested in learning more about environmental manpower planning as it relates to the wastewater utilities industry are encouraged to begin by reading Manpower Planning for Wastewater Treatment Plants[3]. This manual provides excellent background material on environmental manpower planning and develops in detail the procedures for applied manpower planning for municipal wastewater treatment plants. Other documents which will assist you in environmental manpower planning are Estimating Costs and Manpower Requirements for Conventional Wastewater Treatment Facilities[4]; Estimating Staffing for Municipal Wastewater Treatment Facilities[5]; and Estimating Staffing and Cost Factors for Small Wastewater Treatment Plants Less Than 1/MGD, Part I[6]. Readers are also encouraged to contact the Texas Water Quality Board's Environmental Education & Training Section for manpower planning data or assistance.

The manpower data base, when completed, will provide the quantifiable data essential to the development of a more comprehensive manpower planning function for the wastewater treatment workforce of Texas. It is our expectation that environmental manpower planning will continue to grow to include the identification and solution of a wide range of problems confronting the many dedicated individuals engaged in this important aspect of environmental protection.

REFERENCES

[1] Eric W. Vetter, "The Nature of Long Range Manpower Planning," Management of Personnel Quarterly (Summer, 1964) p. 21.

[2] Harbridge House, Inc., Effectiveness Evaluation of Operator Training Conducted Under the PSC Program (June, 1972) prepared for the U.S. Environmental Protection Agency, p. 58.

[3] Olympus Research Corporation, Manpower Planning for Wastewater Treatment Plants, prepared for the Office of Water Programs, U. S. Environmental Protection Agency.

[4] W. L. Patterson and R. F. Banker, Estimating Costs and Manpower Requirements for Conventional Wastewater Treatment Facilities (Kansas City, Missouri: Black and Veatch Consulting Engineers, October, 1971) prepared for the Office of Research and Monitoring, U. S. Environmental Protection Agency (Contract No. 14-12-462).

[5] Operation and Maintenance Program, Office of Water Program Operations, U. S. Environmental Protection Agency, Estimating Staffing for Municipal Wastewater Treatment Facilities (Washington, D.C., March, 1973), Contract No. 68-01-0328.

[6] E. Robert Baumann, et. al., Estimating Staffing and Cost Factors for Small Wastewater Treatment Plants Less than 1/MGD, Part I. Staffing Guidelines for Conventional Municipal Wastewater Treatment Plants Less than 1/MGD (Iowa State University, Department of Industrial Engineering and Engineering Research Institute, June, 1973) prepared for the Manpower Development Staff, Office of Water Programs Operations, U. S. Environmental Protection Agency (Grant No. 5P2-WP-195-0452).